# Growth, Comparative Advantage and the Economic Effects of Government. A Case Study of Ghana

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## Abstract

Economic historians of West Africa have argued that market principles have determined economic organisation in the area. In Ghana such market principles have been associated with long periods of growth in the cocoa sector. However, this growth has not led to incomes comparable with those of developed countries. Our central question in this thesis is why have markets failed to produce such levels of income? A first step to answering this question is provided in chapter 2 where we set out a model for the growth of the cocoa sector in Ghana to examine how markets have succeeded in generating growth and to analyse the factors limiting growth. Chapters 3 and 4 test the implications of the model for both the major periods of growth in the cocoa sector and extend the analysis to the whole economy. Rapid aggregate per capita growth is shown to have occurred until 1939, in contrast to stagnation after 1950. Growth and productivity in the cocoa sector is examined in detail. In chapters 5 and 6 we investigate the role of market failure in limiting the growth process already documented. We argue in chapter 5 that one rationale for public sector intervention offered in development economics is an assertion of the empirical importance of market failure, particularly in labour, trade and investment markets. We show that while some of these aspects of market failure were present they were not empirically important. The market failure that was important for the cocoa sector, analysed in chapter 6, was in the market for technical knowledge. We show that the causes of poverty in Ghana before 1939 are due to this market failure, while after 1950 the cause must be sought in the public sector's unwillingness for rational political reasons to operate through markets. A final chapter summarises the argument.

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## Tables and Charts

## Charts



## A Note on Names and Units

In this thesis we discuss contemporary Ghana. Until independence in 1957 the country was called the Gold Coast. We refer throughout our period only to Ghana as a matter of convenience.

The currency unit used in the text is the Cedi (NC). NC is used to denote New Cedi being the unit chosen in 1967 by which £G1 = NC2. Appendix table 10 gives exchange rates from 1950.

## Preface

This thesis was begun soon after I arrived at the School of Oriental and African Studies in October 1978. It would not have been possible without the generosity of the School in financing two visits to West Africa. The second, during the summer of 1981, included a four month stay in Ghana, during which much valuable information was collected. Everybody who has worked in Ghana is aware of the friendliness of Ghanaians. I am particularly indebted to Dr V A Martinson and her colleagues at the Cocoa Research Institute, Tafo whose patience in explaining the agronomic aspects of cocoa has probably been inadequately rewarded by the remaining errors in this thesis. During my visit I was fortunate to meet Dr D F Edwards and Mr P Hammond, whose knowledge of the Ghana cocoa industry is enormous and whose assistance was invaluable.

From SOAS I would like to thank my supervisor, Peter Ayre, for his assistance over the long time writing a Ph.D takes. Richard Jeffries has provided encouragement and, together with Caroline Dinwiddy, an indefatigable and possibly irrational belief that I could write clearly. Caroline Dinwiddy has commented in detail on every aspect of the thesis and has saved me from numerous errors. I must add that I have not always taken the advice that has been offered. Finally I must thank Rita Charlton for her excellent typing and patience with dealing with each draft.

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# Chapter 1. Introduction: Markets in West Africa

This thesis is concerned to provide an economic interpretation of patterns of growth in certain areas of West Africa in the twentieth century. Although we believe our arguments to be generally valid for what Tosh (1980) has identified as the forest economies of West Africa, we will focus on Ghana. Our interpretation is economic in the sense that it views markets, market structure and factor endowment as central elements in the explanation of the growth rate and growth pattern of West African economies.

The organising principle used by Hopkins (1973) in his classic study of West African economic history is that of the market. The concept of the market

> "... has three dimensions: first, the volume and value of goods and services transacted, which determine the extent of the market in quantitative terms; second, geographical variations in exchange activity, which fix the extent of the market in spatial terms; and third, the number and social status of the parties engaged in exchange, which influence the composition of the goods and services traded. The market is a theme that can be followed with the help of both qualitative and quantitative evidence. The former is predominant in the pre-colonial period, and the latter becomes important in the twentieth century."
> [Hopkins (1973: 5)]

Hopkins' study can be seen as an elaboration of Jones' (1960) argument that economic principles guide decision making in African economies. By economic principles is meant that

> "prices are determined by supply and demand, and that the profitability of various transactions influences the volume and type of goods placed on the market and the factor combination required to produce them."
> [Hopkins (1973: 5)]

In this thesis we intend to extend the argument advanced by Hopkins and Jones by asking why, if market principles have determined economic decision making, economic growth leading to high incomes has not been achieved in Ghana. Hopkins is not primarily concerned with whether the markets he examines are competitive or with questions of market failure. Our study is intended to examine several areas of market failure in Ghana's economy and to evaluate the extent to which Ghana's inability to sustain the growth rate achieved in the early part of the twentieth century can be ascribed to market failure.

The thesis is divided into seven chapters. The second presents a model of Ghana's growth rate, the implications of which are tested in chapters 3 and 4. Chapter 5 then takes up the question of market failure in the context of the formulation of economic policy in low income countries. In chapter 6 we identify what we view as the central cause of Ghana's failure to grow. A final chapter draws conclusions and summarises the argument.

How we hope to extend Hopkins' argument is best introduced by summarising the major points he makes in defence of the market principle as a guide to behaviour in African economies. The economies of West Africa had in the early twentieth century certain major characteristics in common. Two of the most important ones were the relatively high ratio of land to labour when compared with other poor economies and the relatively low ratios of capital to either land or labour when compared with high income economies. Hopkins argues that the high land:labour ratio explains the land intensive nature of the agricultural techniques used. Innovation, which occurred in, for example, the introduction of new crops, was concerned with saving the relatively scarce factor of labour and did not occur in other areas where it was not profitable. The focus on labour time being the constraint on innovation in Africa has also been argued very cogently by Doyle (1974).

In summarising his argument, Hopkins concludes that:

> "A survey of the principal activities (within West Africa) has demonstrated that their history was far from static, that their organisation was efficient and that Africans were receptive to new ideas, where these were suitable and profitable. Several explanations of economic backwardness, ancient and modern, have been considered and rejected: it has been shown that geographical interpretations based on climate and natural resources are unsatisfactory; that sociological explanations relating to family structure, social mobility, the status-hierarchy and supposedly anti-capitalist values are unacceptable, and the economic explanations concerning the efficiency of the labour force, the organisation of 'primitive' agriculture, communal land tenure and allegedly inadequate commercial institutions are inapplicable."
> [Hopkins (1973: 76)]

Hopkins does note very clearly the constraints which limited internal growth. These constraints can be summarised under three headings. Firstly limitations due to small market size. Secondly high transport costs due to the relative scarcity of labour. Thirdly the lack of technical innovation. The first two constraints clearly flow, as Hopkins notes, from the high land:labour ratio. The third is interpreted as following from the high land:labour ratio as Hopkins argues that it was a lack of population pressure on the land which limited the demand for technical innovation.(1)

Having stressed relative factor endowment in his chapter on the domestic economy, Hopkins then, in discussing the economic history of West Africa from the eighteenth century, utilises three different models. In analysing the replacement of the slave trade by primary commodity exports he uses the 'staple' theory of growth. He then utilises Seers (1963) open economy model to elucidate the structure of the early colonial economy and, thirdly, he uses the vent-for-surplus model to explain the growth in primary commodity exports which occurred from the turn of the twentieth century. Caves (1965) has argued that the vent-for-surplus model can be viewed as a combination of the 'staple' theory of growth and Lewis' surplus labour model. The definition of these models and the validity of Caves' argument we defer until chapter 2. In this introduction we wish to discuss the open economy model which has been, and remains, influential in discussions of West African economies.

The Seers model combines three elements. Firstly it is a stylised description of the facts of the economic structure of a 'colonial' or 'dependent' economy. Secondly it offers an explanation as to the determinants of the growth rate of the economy. Thirdly it implies a policy analysis. The attraction of the model to economic historians has, it would appear, been due to the first of these characteristics of the model. Seers, however, is primarily concerned with factors that induce an 'open' economy to become a 'closed' economy.

The meaning of these terms is most easily shown by quoting Hopkins' summary of the characteristics of an open economy:

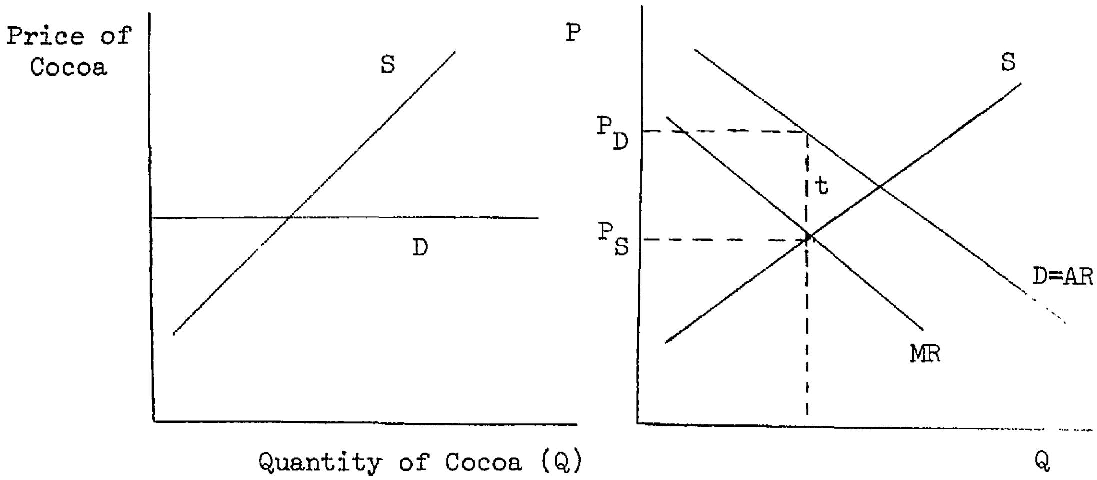
> "Countries in the open phase of development have the following principal characteristics. First, they export a limited range of agricultural and mineral products in exchange for a variety of manufactures, chiefly consumer goods. Second, expatriate interests usually dominate one or more sectors of the economy. In West Africa this domination was especially marked in overseas (but not internal) trade. Third, the major industrial powers were able to exert considerable influence on economic policy, and in the case of colonies to control it completely. The chief aim of expatriate policy is to assist the flow of primary products, and to keep the door open for the sale of manufactured goods. Hence tariffs are kept low, though differential duties and quotas are sometimes imposed in order to restrict the entry of goods manufactured by rival industrial powers. Otherwise, there are few, if any, restrictions on the volume of imports apart from the limit set by the purchasing power of local consumers. Fourth, the metropolitan power aims at minimising its fiscal obligations, and expects its colonies to balance their budgets without external assistance. Fifth, an open economy has a monetary system which is an appendage of that of the major power, while banking arrangements are concerned mainly with financing the activities of the expatriate firms."
> [Hopkins (1973: 169)]

These characteristics are a mixture of empirical observations and policies. The empirical characteristics noted can be interpreted as following from the relative factor scarcities already very clearly documented by Hopkins in his second chapter. Exports were agricultural based because land was abundant, in overseas trade European influence dominated because such activities were capital intensive and in Africa capital was scarce.(2) The policies ascribed to the 'open economy model' are not inevitable policies for an economy exporting mainly agricultural goods and importing manufactures, although they may approximately describe policies pursued by the public sector in Ghana until 1961. The interesting empirical issue is whether these policies were successful in providing the framework for growth. Insofar as the policies included free trade, such a policy would be efficient for an economy small relative to its export market.(3)

Thus the open economy model so far described asserts that in an 'open' phase of development the economy specialises on the basis of comparative advantage and pursues a range of policies, some of which at least are optimal in certain circumstances. However, do such economies grow? It is to answer this question that the second aspect of the Seers model is directed. This explanation is concisely summarised by another economic historian of West Africa who has used the open economy model, Baier (1980: 208):

> "According to the model the long term growth of the open economy is largely determined by the size of export earnings and the degree of responsiveness of demand for imports to changes in income. Although growth can occur, little structural transformation takes place because of built-in restrictions on the volume of investment, a consequence of the limited focus of expatriate activity in both public and private sectors."

While both Hopkins and Baier describe the fluctuations in world demand for primary products in the twentieth century, both appear to accept the analysis of the determinants of growth offered by Seers' model. Hopkins too fails to note that the constraints on growth implied by Seers' model appear inconsistent with his earlier argument that growth was limited by small market size, high transport costs and a low level of technological knowledge. Neither Hopkins nor Baier note that Seers' model assumes that not only is the economy 'open' (in the sense described) but that it is 'large' in the sense that its output is sufficiently sizeable as a proportion of world output to influence price. Although the point is absolutely basic to understanding the interaction of demand and supply factors in the determination of growth rates, this point concerning the distinction between 'large' and 'small' countries does not seem well understood in the economic history literature.




Ghana Cocoa
1891-1911
(A)

Ghana Cocoa
1911-1970
(B)

Diagram 1.1

Diagram 1.1(A) and 1.1(B) show the central analytical distinction that for a small country, for example Ghana 1891-1911, its cocoa output faces an infinitely elastic demand curve (D). Its supply curve (S) will depend on transport costs and technology. For a small country the demand and supply of exports is that shown in diagram 1.1(A). Changes in the costs of production will shift the supply curve but such shifts will not lower the prices faced by Ghana. This, of course, is not to assert that the price may not fall due to supply changes elsewhere. However, in the absence of a cartel such changes are exogenous to Ghana and there is nothing Ghanaian policy can do to influence the outcome. For the large country assumption shown in diagram 1.1(B) the position is very different. Now shifts to the right lower the price faced by Ghana's own exports and, as is well known, optimal policy in this case is for an export tax, t, shown in the diagram as the difference between $P_D$ and $P_S$.

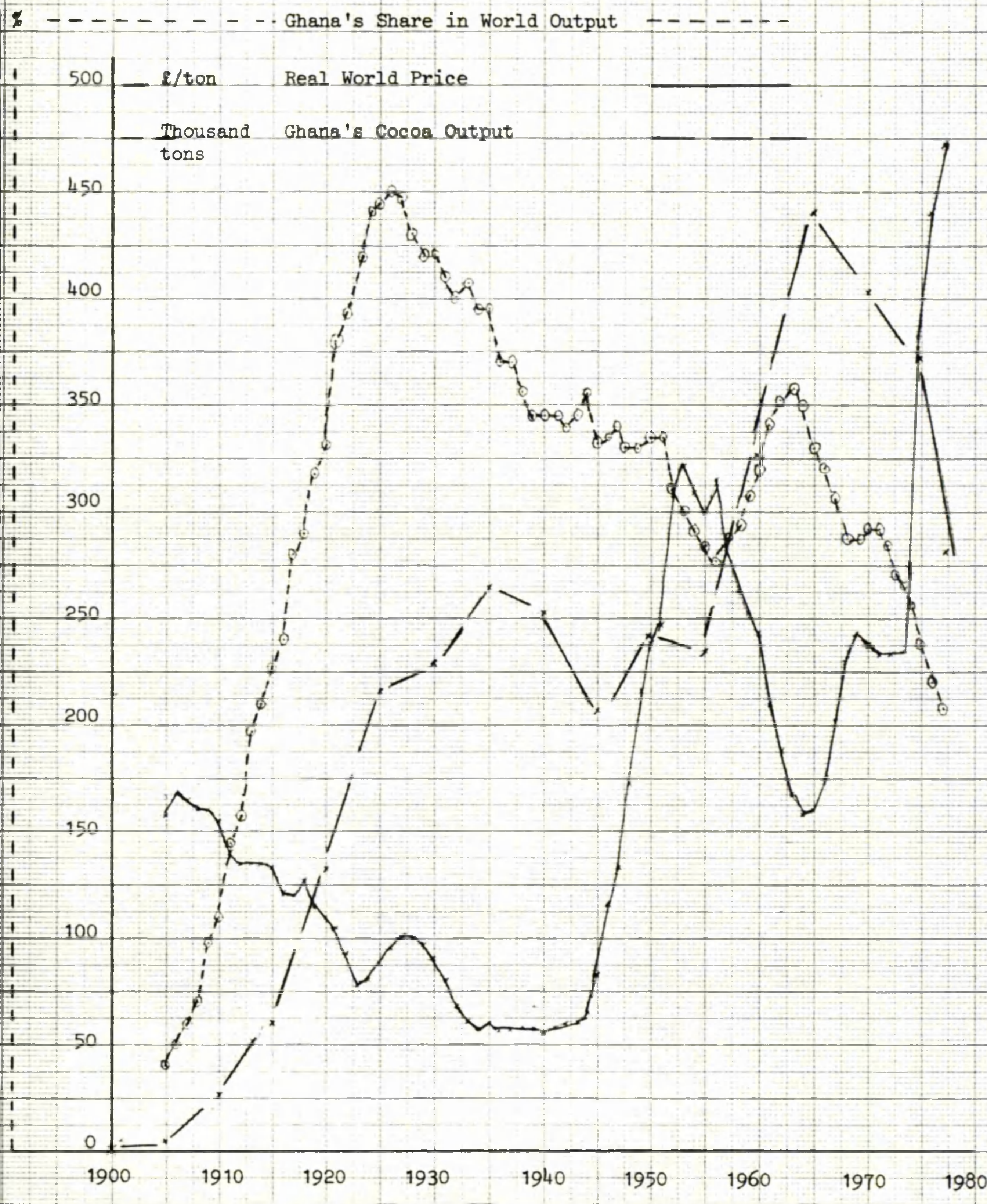
As until the early 1900s Ghana exported no cocoa clearly during the initial phase of growth Ghana was a small country. However, by 1911 Ghana supplied 16 per cent of world output (Appendix Table 14), a contribution which was to rise substantially until the 1920s. Chart 1.1 (page 16) plots Ghana's share of world cocoa output, Ghana's output and a 'real' world price series for cocoa from 1900-1980. (This 'real' price is unit value of US imports of cocoa deflated by a unit value series of world exports of manufactures.)

The implications of Ghana becoming a 'large' country in the cocoa market are immediately apparent: Ghana's cocoa output expanded continuously from 1900 to 1939, during which time the real price was reduced to one third of the level it had been in 1900. Thus from 1911 demand may be said to constrain output in the sense that how much cocoa Ghana can socially profitably produce depends directly on the income elasticity of demand for cocoa and the rate at which foreign income grows. These two factors determine the rate at which the demand curve in diagram 1.1(B) shifts to the right. In the small country case the level of output depends only indirectly on aggregate demand as this, with aggregate supply (which the small country cannot control) determines price.

Thus it is possible to reconcile the constraints on growth implied by the Seers model and those detailed by Hopkins of small market size, high transport costs and a low level of technological knowledge by noting that both demand and supply influence price. However, only in the large country case does demand influence optimal policy. In the small country case the optimal policy is not to tax exports and to allow supply to expand to the point where the marginal cost of supply equals the world price. The implications of changing relative export prices for Ghana's real growth up to 1939 and beyond are the subject of chapter 4.

**Chart 1.1 Ghana's Cocoa Output, Real Cocoa Price and Ghana's Share in World Output**

Five Year Averages of




Sources: The data are five year moving averages from Appendix Tables 1 and 14.

Even if the economy is 'open' (i.e. using prices not quantity controls and with minimal distortion of domestic prices from international prices) and 'large' (i.e. facing a less than infinitely elastic demand curve) as in the Seers model, is the explanation offered for the mechanism of growth adequate? This question has been raised by Findlay (1973), who provides a brief algebraic summary of the Seers model.

Writing Yc, Yp for real income levels in the two areas (centre and periphery) and Mc, Mp for import levels, we have that imports are linearly dependent on income,

$$Mc = A + B\ Yc \qquad (1.1)$$

$$Mp = a + b\ Yp \qquad (1.2)$$

Trade is always balanced, so

$$Mc = Mp \qquad (1.3)$$

giving the determinant of Yp as,

$$Yp = \frac{(A - a) + B\ Yc}{b} \qquad (1.4)$$

Clearly in this model the growth of the periphery depends on growth at the centre and the respective marginal propensities to import. However, Findlay argues that "this model is much too crude and rigid to be acceptable. Relative prices are ignored, structural change can find no place and such questions as why the periphery cannot raise its growth by increasing saving or technical progress can find no answer within this framework. It is true that Seers discusses all these and other problems very cogently in his paper, but he does not succeed in integrating them into the model itself."
[Findlay (1973: 78)]

Findlay then develops a model where structural change is possible. Findlay's model contains two goods, an agricultural good facing a downward sloping demand curve, and a manufacturing good facing an infinitely elastic demand curve. After presenting a model with only an agricultural good and only a manufacturing good, Findlay analyses the conditions in which both goods will be produced. His analysis is conducted in terms of three growth rates,

$g$ = rate of growth of capital at any instant,

$\mu$ = rate of growth of capital when only manufacturing production,

$\lambda$ = rate of growth of world demand for agricultural export.

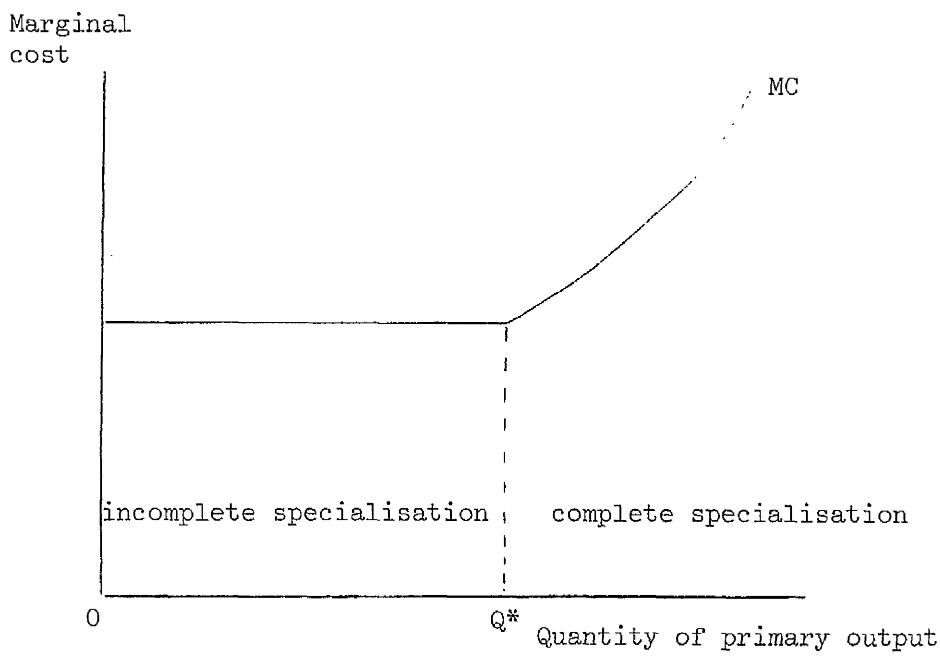



Diagram 1.2

Diagram 1.2 is taken from Findlay. It "shows the marginal cost of primary production in terms of manufactures as a function of the level of primary production. The curve has a flat portion corresponding to constant marginal cost under incomplete specialisation and a rising portion after all capital has been allocated to primary production and the output of manufactures has fallen to zero". [Findlay (1973: 90)]

If in the initial position there is no manufacturing production then "it is clear that the marginal revenue product of capital will be higher than what it would be if any capital were allocated to the manufacturing sector. Moreover there is additional profit because of the excess of price over marginal revenue". [Findlay (1973: 91)] The analysis assumes that capital formation for both sectors is proportional to the rate of profit, the implication being that if in the initial position there is no manufacturing production then $g > \mu$.

What happens then depends on whether $\mu > \lambda$ or $\mu < \lambda$. If $\mu > \lambda$ then eventually all capital will be allocated to manufacturing. It is only then that growth is determined by internal rather than external conditions. This model is of considerable interest because it goes far beyond the Seers model, making clear the importance of an optimal tax on the export by distinguishing clearly the nature of the demand schedule facing the exporter. Although Findlay characterises the two goods in his model as 'agricultural' and 'manufactures', it is clear from his analysis that the important policy distinction is not in the nature of the goods but in the degree of elasticity of their demand schedules. Whether Ghana's growth was limited to $\lambda$, the rate of growth of world demand for cocoa, and whether and how far the economy diversified is the subject of empirical investigation in chapter 4.

The third aspect of the Seers model concerns the policy implications which are viewed as following from the explanation of the determinants of growth. The open economy, it is argued, will experience increasing balance of payments problems as the income elasticity of demand for imports is large so that, given low export growth, any attempt to grow will meet balance of payments 'constraints'. A 'closing' of the economy is necessary to reduce imports by quantity controls (licensing) and exchange rate controls. This 'closing' of the economy to foreign trade influences must be allied with an internally oriented growth programme (increased domestic investment). Both these policies imply an autonomous central bank. Thus the policies advocated are the reversal of the policies outlined above in the Hopkins summary of the characteristics of the open economy model. Lewis (1969) has linked the trade arguments derived from open economy models with arguments concerning productivity growth to argue that high productivity growth in exports combined with low growth of productivity in the food sector is the basic cause of poverty.(4) Lewis states that "historically there has been an ever widening gap in food productivity per person as between the tropics and the temperate world and this is the main reason for the ever-widening gap between temperate and tropical standards of living." [Lewis (1969: 20)] The implications of this view are stark:

> "For the last eighty years the tropical countries have put practically all their agricultural research and extension funds and efforts into trying to raise the productivity of export crops like cocoa, tea or rubber and virtually no effort into food productivity. From their point of view, this effort was wholly misdirected."
> [Lewis (1969: 21)]

The policies of colonial governments stand heavily indicted by both Seers and Lewis. Seers views colonial policy as restraining, possible preventing, growth through the absence of autonomous money creation institutions, non-optimal taxes on exports and the failure to plan. Lewis goes further and argues that where intervention did occur, in seeking to raise the productivity of export crops, the effort was wholly misdirected. We have argued that the policy conclusions of the Seers model follow from its explanation of the determinants of growth. In chapter 2 we present the alternative models used by Hopkins to explain aspects of the growth of West African economies, namely the 'staple' and the 'vent-for-surplus' models. In chapter 3 we examine the productivity and factor inputs into Ghana's cocoa industry from 1900-1975. We show that over the period 1900-1939 cocoa output grew rapidly while productivity fell. From 1950-1975 further output growth occurred in the cocoa sector but at approximately half the rate that had occurred in the colonial period. We show that this was not due to the exhaustion of available cocoa land. In chapter 4 we consider how this real output growth converts to real income growth both for the cocoa sector and the whole economy. We argue that rapid aggregate per capita growth until 1939 contrasts with negligible per capita growth over the period 1950 to 1974. Thus in chapters 3 and 4 we present the data necessary for testing the model of chapter 2. We return to the issues of policy in chapters 5 and 6. Chapter 5 introduces our focus on policy by distinguishing neoclassical policy formulation and political economy. We will argue that both Seers and Lewis can be viewed as urging, within the context of neoclassical economic analysis, the empirical importance of certain forms of market failure in labour, trade and investment markets. We seek to show in chapter 5 that while some of these market failures were present they were not empirically important. In chapter 6 we argue the importance of a market failure widely regarded as of importance in economics generally but little discussed in the context of development economic policy, namely the failure of markets in technical knowledge to exist. We argue that this market failure, rather than the market failures identified by Seers and Lewis, is central to understanding why markets in Ghana have not led to the high income levels characterising a developed economy. While this 'failure' was inherent in private market institutions, the fundamental empirical fact must not be obscured that real incomes have grown far faster in the period until 1939 than in the period since 1950. Before documenting this assertion we consider the appropriate model for the Ghana economy.

# Chapter 2. The Vent-for-Surplus Growth Model

## 2.1 Introduction

In this chapter we set out and discuss the growth model we believe explains the growth rate and growth pattern of West African forest economies, the vent-for-surplus model. In section 2.2 we review the background to the model. In section 2.3 we set out a formal statement of the model and, finally, in section 2.4 derive the implications of the model which will be tested in chapters 3 and 4. As an introduction to justifying the choice of this model we discuss in this section some of the methods which have been used to both describe and analyse the mechanism of growth. Some of these methods can be incorporated into the framework of the vent-for-surplus model and we will indicate how we propose to use these methods in this thesis. We will also indicate those approaches we believe to be misleading or wrong. In doing so we anticipate some of the empirical results from later chapters. This is necessary to justify our contention that some of the explanations advanced are inconsistent with the basic facts of Ghana's twentieth century economic history.

Among the most important of the methods for analysing the causes of growth is that based on the estimation of an aggregate production function due initially to Solow (1957) and Denison (1962). The data requirements of this method are considerable, as are the conceptual problems involved in the high level of aggregation used, and the method has not previously been applied to West Africa. In chapter 3 we use a stylised production function to model the cocoa sector of the Ghanaian economy. An econometric estimation of the cocoa sector is not possible from the data but the production function provides a stylised representation of the sector which, we argue, is consistent with the available data.

The sources of growth methodology we will argue is wholly consistent with the vent-for-surplus model but in what sense does the sources of growth methodology explain growth? Kelley, Williamson, Cheetham (1972: 3) have argued that "the analysis is descriptive; it provides an accounting decomposition of input growth that must totally account for (but not necessarily explain) output expansion"; however, "to the extent that each factor input grows exogenously and is completely independent of the growth in other inputs, the sources-of-growth methodology both accounts for and explains development". Kelley, Williamson, Cheetham then argue that factor growth is not exogenous so that the methodology is incomplete as an explanation of the growth process. As we show below, this is also true for the vent-for-surplus model, where factor supply depends on relative prices which alter as a result of increased supply.

A second method of analysing the causes of growth is that based on an analysis of demand and structural change. The work of Kuznets (1966) (1971), Chenery (1960), Chenery and Taylor (1968) and, most recently and comprehensively, Chenery and Syrquin (1975) seeks to establish the existence of systematic patterns of change in industrial structure and in demographic and locational patterns within countries over time. This methodology has used large samples of pooled cross-section and time series data. While changes in trade patterns and the relationship of trade to growth has been included in these studies, another group of studies, Maizels (1963), Maizels (1968) and Batchelor, Major, Morgan (1980) have investigated patterns of change in trade composition and origins in more detail. The focus of the two sets of studies is different but both are concerned with deriving empirical regularities in demand and supply patterns in growing economies over time.

The methodology developed by Chenery seeks to provide a paradigm of the development process by showing not a division of countries into 'developed' and 'underdeveloped' but a pattern by which all countries can grow from underdeveloped to developed. It is recognised that the size of a country is an important exogenous influence ensuring systematic differences in growth patterns between large and small countries, and this variable is incorporated in the regression results. However, country size is not included because of its significance in determining the elasticity of the demand schedule facing exporters; the focus of the analysis is rather on the extent of primary product specialisation.(1)

Chenery's methodology seeks to infer from empirical data 'typical' patterns of development rather than separating clearly market directed changes from policy intervention. Thus Chenery and Syrquin (1975: 5) argue that

> "... our primary concern here is the identification of the uniform factors ... which affect all countries. Since these typically account for well over half the observed variation among countries in most structural characteristics, the effects of factors specific to a given country can be more readily evaluated after allowing for the uniform elements in each development pattern."

However, these uniform factors include the level of income which is obviously influenced by both market opportunities and policies so the analysis fails to distinguish policy induced from market induced structural change. Thus to classify countries by, for example, primary product specialisation will mix countries where such specialisation is economically efficient (small countries) with those where it might not be (large countries). Thus this way of proceeding makes analysing the efficiency of policy impossible. There is a further difficulty with the procedure in that it is unclear what explanation is being offered for the income changes. Sometimes demand patterns are mentioned, for example

> "general models of structural change applicable to all countries can be derived from the following types of assumptions:
> 1. Similar variation in the composition of consumer demand with rising per capita income, dominated by a decline in the share of foodstuffs and a rise in the share of manufactured goods."
> [Chenery and Syrquin (1975: 5)]

Such demand changes would only necessarily imply structural changes in output in a closed economy model. The focus on demand is, as we noted in chapter 1, a feature of the open economy model. This model is an extension of the closed economy model which introduces trade as another source of demand. The aspect of trade on which attention is focused is that exports are limited by world demand. Thus Nurkse's (1959) well known distinction between patterns of demand for primary products between the nineteenth and twentieth centuries. The models in this category can be viewed as extensions of the Keynesian model and include the two-gap model developed by Chenery and Strout (1966) in which, if the trade constraint is operative, exports are regarded as exogenously determined. This large open economy model also appears to provide the explanation of the role of trade in growth in the Chenery and Syrquin (1975) analysis. Their model, which is developed rather informally, views exports as exogenously determined. Two examples of their procedure are, firstly:

> "Some primary exports depend to a high degree on natural resource endowments, they can be considered largely exogenous. While the desirability of developing other exports (manufactures and services) depends on what level of primary exports can be achieved, a country's success in developing non-primary exports is largely a result of government policy. When these export levels are treated as exogenous factors, therefore, elements of both natural endowments and policy reactions to them are combined."
> [Chenery and Syrquin (1975: 68)]

As the model is informally developed it is unclear what variables are being treated as exogenous. The extent of natural resource endowment is exogenous, i.e. uninfluenced by policy variables, but the profitability of exploiting these natural resource endowments is not exogenous to policy as our study of Ghana's economy will show. Further, to term a variable as 'exogenous' which 'is largely a result of government policy' seems contradictory for a model purporting to analyse the consequences of policy.

The view that poor countries' exports are demand determined is explicitly stated later, where it is argued that

> "just as the development patterns of large countries reflect their concern with the internal market, those of small countries are more influenced by external markets and capital flows. Few small countries are able to sustain satisfactory rates of growth with import levels of less than 20% of GNP, and the norm varies from 20% to 30% for the smallest units. Since over the 1950-70 period primary exports (excluding petroleum) expanded at only about 3% a year (in both quantity and value terms) most developing countries must at some point shift toward non-primary exports if they are to continue to expand."
> [Chenery and Syrquin (1975: 89)]

This argument is already familiar from the Seers model discussed in chapter 1 and arguments of this form have greatly influenced policy making in poor countries generally and in Ghana in particular. The underlying model is of trade constrained growth, identical in form to that advanced by Findlay (1973). The relevant distinction here, as there, is between large and small markets. A country which supplies an insignificant fraction of world output cannot, by definition, be demand constrained. We explore the importance of this distinction for Ghana in chapter 4, where we show that for non-cocoa exports supply in the 1930s grew at a rate of 6.3 per cent per annum due to domestic policy allowing comparative advantage to operate, whereas over the period 1950-70 they grew at 2.2 per cent per annum due to domestic policy not allowing comparative advantage to operate. These growth rates clearly imply that demand factors are wholly irrelevant to a discussion of the growth rate of Ghana's non-cocoa exports. Insofar as Ghana's policies were typical, it would be a more correct description to say that "most developing countries have pursued policies so unfavourable to the growth of exports that over the period 1950-70 world supply only grew at the rate of 3% p.a. for primary products, whereas for manufacturing output it grew at 9% p.a.". The Chenery and Syrquin (1975) analysis is in the line of those who have viewed trade as an 'engine of growth'. The contrary view is stated at a general level by Kravis (1970: 858) who argues that "in their direct impact, however, trade and capital movements were supplementary factors, they were handmaidens not engines of growth. The mainsprings of growth were internal; they must be sought in the land and people, and in the system of social and economic organisation".

This thesis can be viewed in part as a detailed case study supporting Kravis' view in that Ghana's growth occurred by exploiting Ghana's comparative advantage and its abundant land. Until 1939 the system of social and economic organisation permitted the exploitation of profitable investment opportunities; world prices largely guided investment decisions, ensuring they were efficient; public sector investment lowered transport costs (although there is evidence that this programme was inefficient and could have reduced costs further by a lower level of investment in railways than actually occurred);[2] and, most important of all, the failure of productivity growth in cocoa, which we document in chapter 3, had not prevented extensive growth. The growth process depended on capital widening rather than capital deepening and by 1939 had succeeded in raising GDP/capita by a factor of 2.5 times over the level of 1891 (chapter 4), a trend rate of growth of nearly 2 per cent per annum for a period of nearly 50 years.

Kuznets (1966: 64-65) provides long period growth rates for 14 industrialised countries. The growth rates for product per capita per decade for the UK and US ranged from 2 per cent (the UK, 1700-1780) to 17.2 per cent for the US from 1839 to 1960-62. The highest growth rate per decade achieved by the UK was 14.1 per cent for the period 1855-59 to 1957-59. Ghana's growth rates per capita are given in chapter 4 as:

Rates of Growth of GDP per Capita per Decade in %

| | |
|---|---|
| 1891-1901 | 9.2 |
| 1901-1911 | 32.5 |
| 1911-1919 | 36.3 |
| 1919-1929 | 18.0 |
| 1929-1939 | 7.3 |

These growth rates for 1901 to 1929 greatly exceed those achieved by the UK and US economies. Ghana over this period grew and grew at spectacular rates and during this period there was no substantial industrialisation. Ghana's economic history in the twentieth century is wholly incompatible with the scheme established by Chenery. No doubt one inference is that Ghana is wholly atypical but another is that the regression equations represented by Chenery and Syrquin neither explain nor describe development but simply correlate GDP with certain aspects of the economy, for example, the share of industry in GDP. However, how are we to interpret this correlation? Are countries rich because they industrialise, or do they become rich and then industrialise? A strict interpretation of Chenery's regression results implies only the latter, whereas the policy inference drawn has usually been the former.

However, none of Chenery's results can, in principle, be used for policy analysis. The regression equations all use OLS and income and population variables as regressors. Thus the equations assert that income levels explain the endogenous variables but as none of the regressors are policy variables, none of the regressions can be used for policy analysis. Even if empirical patterns of development can be detected, and there are not too many exceptions like Ghana, such patterns are wholly useless as a guide to policy.

Ghana's period of rapid growth was to end in 1939. Again we will agree with Kravis that it was domestic policy which prevented growth. One of the influences on that policy was a framework similar to that presented by Chenery and his associates. We will thus seek to argue that not only does his analysis not provide any base for policy formulation, but that it has been widely used to justify policies which have proved detrimental to growth.

Before we can turn to these issues, we must set out the model we believe does explain Ghana's growth rate and pattern, namely the vent-for-surplus model.

## 2.2 Vent-for-Surplus, Comparative Advantage and Factor Supply

In this section we review the background to the vent-for-surplus model of international trade which was originally due to Adam Smith but owes its modern formulation and application to Myint (1958). Myint appears mainly to have been interested in the economies of South-East Asia but the model has been widely applied to West Africa: Helleiner (1966a) applies it to Nigeria; Szereszewski (1965) to Ghana and Stryker (1974) to the Ivory Coast. It is the striking growth of the Ghana cocoa industry that the vent-for-surplus model seeks to explain.

Although there is evidence that cocoa was first planted in Ghana as early as the 1850s, it was not until the 1880s and 1890s that a sustained growth in cocoa acreage occurred.(3) The output of Ghana grew from nothing to being the world's most important single source of cocoa by the 1920s. This growth was entirely due to peasant small-scale producers. Ghana's output of cocoa reached a peak before the Second World War of 304,800 tonnes in 1937, representing 41 per cent of world exports. From this peak, Ghana's output was to decline to 195,200 tonnes in 1947, a level which had previously been reached 25 years earlier. From 1947 output was to grow over the next 20 years, reaching another peak in 1964/65 of 580,800 tonnes, representing 38 per cent of world exports. This level was never to be reached again and by the latter 1970s output had fallen below 300,000 tonnes and has continued to fall since. (Appendix Tables 1 and 14.)

There have been two major cycles in the growth of the Ghana cocoa industry which can be clearly seen on chart 1.1 (page 16). Over the period 1900 to 1936 (the pre-war peak) output grew at a rate of 18 per cent per annum. The second cyclical upturn saw a growth between 1947 and 1965 (the post-war peak) of 6.1 per cent per annum. It is argued that at least in the first of these cycles food output, the major alternative agricultural output, did not decline. The inference drawn by Szereszewski (1965) for Ghana and argued generally by Myint is that factor supply increased.

Myint argues for the empirical relevance of two of Adam Smith's views on trade. These are firstly that "international trade overcomes the narrowness of the home market and provides an outlet for the surplus product over domestic requirements". [Myint (1958: 319)] It is the development of this idea which has come to be termed the vent-for-surplus theory of international trade. Secondly, "by widening the extent of the market, international trade also improves the division of labour and raises the general level of 'productivity' within the country". (319)

Both these views appear to differ from Ricardian comparative cost. In comparative advantage theory 'specialisation' means a movement along a static production possibility curve. In contrast, the second of Adam Smith's views on trade

> "looks upon international trade as a dynamic force which by widening the extent of the market and the scope of the division of labour raises the skill and dexterity of the workmen, encourages technical innovations, overcomes technical indivisibilities and generally enables the trading country to enjoy increasing returns to scale and economic development. This distinction was clearly realised by Mill, who regarded the gains in terms of comparative cost theory as direct gains

> and the gains in terms of Adam Smith's increases in productivity as 'indirect effects which must be counted as benefits of a high order'. Mill went on to extend this doctrine to countries at 'an early stage of industrial advancement' where international trade by introducing new wants 'sometimes works a sort of industrial revolution'."
> [Myint (1958: 320)]

Myint argues that it is the first, not the second, of Smith's views which provides an explanation of the nature and pattern of growth of the West African economies. Myint argues that the total value and physical output of the exports of these countries expanded rapidly, not by a better division of labour and specialisation leading on to innovations and cumulative improvements in skills and productivity per man hour, but rather due (1) to once-for-all increases in productivity accompanying the transfer of labour from the subsistence economy to the mines and plantations, and (2) (more importantly) an increase in working hours and in the proportion of gainfully employed labour relative to the semi-idle labour of the subsistence economy.

> "Thus instead of a process of economic growth based on continuous improvements in skills, more productive recombinations of factors and increasing returns, the nineteenth century expansion of international trade in the underdeveloped countries seems to approximate to a simpler process based on constant returns and a fairly rigid combination of factors. Such a process of expansion could continue smoothly only if it could feed on additional supplies of factors in the required proportions."
> [Myint (1958: 322)]

We will return to the second of the ideas developed by Smith later; here we consider further Myint's notion of the vent-for-surplus mechanism. Caves (1965) has argued that Myint's version of vent-for-surplus can be viewed as a combination of two other models with similar general characteristics. These are the 'staple' theory where an economy is "characterised by 'surplus' natural resources whose existence or economic usefulness is freshly discovered"

Caves (1965: 97) and the 'unlimited labor' model advanced by Lewis (1954).

Caves argues that these three versions of vent-for-surplus all have a similar theoretical structure which we briefly summarise. The model consists of two regions, one large and mature (region 1, e.g. Europe), the other not (region 2, e.g. North America). Europe is industrialised, America is not. However, natural resources are discovered in America cheaper than in Europe. Once discovered and exploited a Ricardian rent accrues to the owner. Factors flow into the new region until rents are exhausted.

> "The process of exploiting 'surplus' resources in 2 so far is one of eliminating a disequilibrium situation - a wave of growth for the infant economy of region 2 with a pace constrained by whatever short run factors restrict the international migration of labour or capital, or the combination of these factors with newly discovered natural resource deposits. The attainment of equilibrium in the world market (for the resource intensive good) will curtail the growth rate of region 2 - to zero, by our assumptions, since no other sources of growth are included."
> [Caves (1965: 100)]

It is this central theoretical result in which we will be interested. It is important to note that although the long-run growth of this sector is zero, the economy is richer by the extent of the rental income that accrues and will continue to earn a rental income on intra-marginal sources of supply. Caves also notes that if the economy has used its income to invest in other profitable sectors there may well be an 'underlying steady swell of neoclassical growth' (Caves 1965: 102) which can continue once the rent from the resource intensive sector is exhausted.

We return to these issues for Ghana in chapters 3 and 4 where we attempt to measure both the productivity changes within the cocoa sector and the consequences for the rest of the economy of the growth of the cocoa sector. The many parallels between the growth process in North America and in West Africa, at least in terms of the model used, seem to have gone unremarked in the literature. We turn to this topic in chapter 6. However, before turning to a more formal development of the vent-for-surplus model, we wish to consider the second of Adam Smith's views on international trade.

The second of the Smithian ideas of international trade identified by Myint is the view that "by widening the extent of the market, international trade also improves the division of labour and raises the general level of 'productivity' within the country". This doctrine of Adam Smith's is paralleled by Hopkins' view that market size did constrain growth in West Africa. Evidence for the importance of market size is provided in the study of import and export trade by Bauer (1954) who argues convincingly that one of the reasons for the high degree of concentration in the market was its small size. Bauer's study concludes in the 1950s; however, a study for Nigeria which covers the period until the mid 1960s, Kilby (1969), shows that with expanding market size the oligopolistic position of the established trading firms was threatened by competition attracted by the lower costs of selling in a larger market. However, in marked contrast to the experience of the foreign trading firms, as the cocoa market grew, although some specialisation occurred, for example by contracting out of food production and by larger farmers acting as marketing agents, this process does not seem to have advanced very far. In the main over much of the period the firms (i.e. farms) seem to have changed little.[4] Why was this important source of increased productivity not forthcoming? We attempt an answer to this question in chapter 6.

Thus Adam Smith's views on trade have been influential in suggesting explanations for West Africa's growth pattern. The two Smithian ideas are, as Myint notes, quite distinct, so in this chapter we only consider the vent-for-surplus notion. In chapter 5, having examined how and why the economy grew, we can turn to a consideration of the role of market size in influencing this growth. Myint draws a clear distinction between the vent-for-surplus model and that of comparative advantage; the former focuses on additional factor supply, the latter on factor relocation. To the legitimacy of this distinction and to a more formal statement of the model we now turn.

## 2.3 A Formal Model for Vent-for-Surplus Economies

In this section we set out a formal model to capture the essentials of the model described informally in section 2.2. This allows us to clarify different meanings which attach to the term 'surplus' and to identify more explicitly the mechanisms which may disturb and re-establish the equilibrium of the model.

We begin with a static maximising model which can be interpreted as a model of a household or of an economy able to produce food (F), handicrafts (H) and cocoa (X). Only food and handicrafts enter the utility function, cocoa is exported in exchange for handicrafts and food, although in the algebra only handicrafts are considered.

The production functions for F, H, X are of the standard neoclassical form where inputs are labour hours (L) and land (K) (land and capital are aggregated and we will usually mean both when we refer to 'land'). We distinguish between labour hours (L) and labourers (N).

Work is unpleasant and the disutility of effort is assumed to be a function of hours worked per labourer. The economy is constrained by the number of labourers and land. The economy is assumed to maximise a welfare function, W, which subtracts the disutility of effort from the utility of consumption.

Formally we have,

$$(2.1) \qquad U = U(f, m)$$

$$(2.2) \qquad f = \frac{F}{N} , m = \frac{M}{N}$$

$$(2.3) \qquad F = F(L_1, K_1)$$

$$(2.4) \qquad M = H + \frac{P_X}{P_H} X$$

$$(2.5) \qquad H = H(L_2, K_2)$$

$$(2.6) \qquad X = X(L_3, K_3)$$

$$(2.7) \qquad V^F = V^F(l_1) , V^H = V^H(l_2) , V^X = V^X(l_3)$$

$$(2.8) \qquad l_1 = \frac{L_1}{N_1} , l_2 = \frac{L_2}{N_2} , l_3 = \frac{L_3}{N_3}$$

$$(2.9) \qquad N_1 + N_2 + N_3 = \bar{N}$$

$$(2.10) \qquad K_1 + K_2 + K_3 = \bar{K}$$

$$(2.11) \qquad W = N.U - N_1V^H - N_2V^F - N_3V^X$$

Equation (2.1) is the per capita utility function with arguments per capita food (f) and per capita manufactures (m). Domestic production of handicrafts supplements imports to give total domestic supply of manufactures in equation (2.4). The three sectors, F, X and H, each require factor inputs. Equation (2.7) asserts that disutility, V, is a function of hours worked per labourer. Labour hours (L) depend on the number of labourers (N) and the labour hours worked per labourer (l), equation (2.8). Equations (2.9) and (2.10) show the constraints the economy faces in a given number of labourers, N and a given amount of capital, K. Equation (2.11) gives the net welfare of the community.

We assume initially that the relative price of X and H ($P_X/P_H$) is fixed so the problem can be written as a constrained maximisation where the variables to be optimised are: $N_1$, $N_2$, $N_3$, $L_1$, $L_2$, $L_3$ and $K_1$, $K_2$, $K_3$.

The problem is of the form

Maximise $W$

subject to $N_1 + N_2 + N_3 = N$

$K_1 + K_2 + K_3 = K$

The lagrangean takes the form:

$$W^* = N.U\ [\frac{F}{N}(L_1, K_1)\ ,\ (\frac{H}{N}(L_2, K_2) + \frac{P_X}{P_H} X(L_3, K_3))]$$

$$- N_1 V^F[\frac{L_1}{N_1}] - N_2 V^H[\frac{L_2}{N_2}] - N_3 V^X[\frac{L_3}{N_3}]$$

$$+ \lambda_1[N - N_1 - N_2 - N_3] + \lambda_2[K - K_1 - K_2 - K_3] \qquad (2.12)$$

The first order necessary conditions for a maximum are given by,

$$\frac{\delta W^*}{\delta N_1} = -V^F + L_1 \frac{N_1}{N_1^2} V^F_{l_1} - \lambda_1 = 0 \qquad (2.13)$$

$$\frac{\delta W^*}{\delta N_2} = -V^H + L_2 \frac{N_2}{N_2^2} V^H_{l_2} - \lambda_1 = 0 \qquad (2.14)$$

$$\frac{\delta W^*}{\delta N_3} = -V^X + L_3 \frac{N_3}{N_3^2} V^X_{l_3} - \lambda_1 = 0 \qquad (2.15)$$

$$\frac{\delta W^*}{\delta L_1} = \frac{N}{N} U_f\ F_{L_1} - \frac{N_1}{N_1} V^F_{l_1} = 0 \qquad (2.16)$$

$$\frac{\delta W^*}{\delta L_2} = \frac{N}{N} U_h\ H_{L_2} - \frac{N_2}{N_2} V^H_{l_2} = 0 \qquad (2.17)$$

$$\frac{\delta W^*}{\delta L_3} = \frac{N}{N} \frac{P_X}{P_H} U_h X_{L_3} - \frac{N_3}{N_3} V^X_{l_3} = 0 \qquad (2.18)$$

$$\frac{\delta W^*}{\delta K_1} = \frac{N}{N} U_f\ F_{K_1} - \lambda_2 = 0 \qquad (2.19)$$

$$\frac{\delta W^*}{\delta K_2} = \frac{N}{N} U_h\ H_{K_2} - \lambda_2 = 0 \qquad (2.20)$$

$$\frac{\delta W^*}{\delta K_3} = \frac{N}{N} \frac{P_X}{P_H} U_h\ X_{K_3} - \lambda_2 = 0 \qquad (2.21)$$

where $V^i_j = \delta V^i/\delta_{1j} > 0$ for $i = F, H, X$ and $j = 1, 2, 3$

$U_h = \delta U/\delta h > 0$, $U_f = \delta U/\delta f > 0$

$F_{L_1}$, $H_{L_2}$, $X_{L_3}$ are the marginal productivities of output with respect to labour assumed positive.

$F_{K_1}$, $H_{K_2}$, $X_{K_3}$ are the marginal productivities of output with respect to capital assumed positive.

From (2.13) - (2.15) we have,

$$\lambda_1 = -V^F + l_1 V^F_{l_1} = -V^H + l_2 V^H_{l_2} = -V^X + l_3 V^X_{l_3} \qquad (2.22)$$

From (2.16) - (2.18) we have,

$$U_f F_{L_1} = V^F_{l_1} \qquad (2.23)$$

$$U_h H_{L_2} = V^H_{l_2} \qquad (2.24)$$

$$\frac{P_X}{P_H} \cdot U_h \cdot X_{L_3} = V^X_{l_3} \qquad (2.25)$$

From (2.19) - (2.21) we have,

$$\lambda_2 = U_f F_{K_1} = U_h H_{K_2} = \frac{P_X}{P_H} U_h X_{K_3} \qquad (2.26)$$

Equation (2.22) has an immediate intuitive interpretation. Recall that in deriving (2.22) labour hours are implicitly held constant. Thus equation (2.22) asserts that at the optimum if a labourer is transferred between any two sectors, say from food to handicrafts, then the rise in disutility in handicrafts of the newcomer ($-V^H$) less the fall in disutility of those already there ($l_2 V^H_{l_2}$) equals the net change in utility in the food sector. In other words, at the maximum there is no incentive for a labourer to transfer between sectors.

Equations (2.23) - (2.25) are familiar from Sen (1966) who terms the ratio of disutility to utility 'the real cost of labour' which at the maximum is equal to the marginal product of labour hours. It is clear that if some disutility attaches to labour neither marginal utility nor marginal products will be zero.

Equation (2.26) asserts that the marginal return from capital must be the same in each sector.

Equations (2.22) - (2.26) represent the static equilibrium of the economy. If $P_X/P_H$ is such that for all values of $H_{L_2}$ it is true that

$$\frac{P_X}{P_H} \cdot U_h X_{L_3} > U_h H_{L_2} \tag{2.27}$$

then domestic production of handicrafts will disappear. This possibility has been of much concern in the literature. The belief that a decline in manufacturing output is harmful being, we argue in chapter 4, a nationalist definition of income. However, there is very little evidence that handicraft output did fall and the explanation may be that domestically produced handicrafts were not close substitutes for imported ones.

Having outlined the static equilibrium of the economy, it is now necessary to ask in what sense are labour (L), land (K) or natural resource intensive goods (X) 'surplus'? There are in the literature several meanings to the term 'surplus'. One is that the resource is without social value. If labourers are surplus in this sense then it is a consequence of the economic interpretation of the lagrangean multipliers that $\lambda_1 = 0$. Similarly, if land is surplus in this sense, then $\lambda_2 = 0$. A second use of the term 'surplus' is that labour hours are not fully utilised. Implicitly in deriving the equilibrium of the economy we have assumed this to be the case. A third use of the term 'surplus' in the literature is to refer to an excess of domestic supply over domestic demand at prices which would rule in a state of autarchy (a closely related use of the term is in 'agricultural surplus' where it refers to excess household supply over demand).

This third use of the term 'surplus' can be used in a theory of savings by arguing that excess household supply must equal excess demand by the 'modern' sector. Thus the growth of the 'modern' sector can be viewed as depending on the growth of the 'agricultural surplus'. If modern sector activity is identified with manufacturing investment then the savings to finance this investment must come from this surplus. However, such a model is of relevance only to a closed command economy intent on industrialisation, for otherwise why cannot the agricultural sector invest, using its 'surplus' to finance its investment in non-food exports, as indeed occurred in Ghana? As the ultimate source of the agricultural surplus in this context is the surplus labour hours available to the agricultural sector this third use of the term 'surplus' adds nothing to the earlier ones and will not be used further.

We wish to argue that in the vent-for-surplus model different uses of the term surplus are combined which possibly explains why the analytical basis of the model has remained confused. To consider these different uses, we return to the equilibrium conditions of the model, equations (2.22) - (2.26).

What happens to welfare if the number of labourers increase? If labourers are surplus in the first sense of the term, then $\lambda_1 = 0$, which simply implies a particular form for the disutility function V. This is clearly not the sense in which 'surplus' is being used in the model. It is, we would argue, in the second sense that 'surplus' is used for labour, namely that hours worked per labourer are not at a physical or psychologically determined maximum, but land may well be surplus in the first sense of the term, i.e. $\lambda_2 = 0$.

If this interpretation is accepted, then the vent-for-surplus model postulates the equations (2.22) - (2.26) (which assume surplus labour hours) and $\lambda_1 \neq 0$ and $\lambda_2 = 0$. If $\lambda_2 = 0$, then the marginal product of capital (land) will be zero and the marginal product of labour will equal its average product, Hansen (1979). If land is surplus (i.e. $\lambda_2 = 0$), Stiglitz (1969) suggests that the production function for food can be written,

$$F = N_1 F(l_1) \tag{2.28}$$

i.e. the average product of a labourer in the food sector equals his marginal product which remains constant as the number of labourers increase. If all the production functions were to take this form, it would imply that population growth could proceed leaving per capita welfare unchanged. Aggregate welfare would rise at the same rate as population.

These definitions enable us to compare the vent-for-surplus model with a full-employment model, for example Hymer and Resnick (1969) who postulate that land, although relatively abundant, was not in any sense 'surplus'. In principle the difference between the models is clear. In the Hymer and Resnick (1969) model expansion of the X sector involves contraction of the H sector (which they term Z goods) <u>and</u> the re-allocation of scarce factor supplies, from H to X. In contrast the 'surplus labour and land' model predicts that X output can be expanded without decreasing H production. In the static equilibrium of the model there is no incentive to change either sector output, so it is not yet possible empirically to distinguish the models. Before proceeding to do so we note that the only difference between vent-for-surplus and simple labour surplus is that in the former $\lambda_2 = 0$ while in the latter it does not.

This distinction is not clear in the literature. For example, Helleiner (1966a:10) has argued that:

> "It appears that in this land surplus economy there existed a considerable (potential) 'agricultural surplus' consisting not only of unutilised land but also of unutilised labour, which could be mobilised for the expansion of material output. This surplus differs conceptually from the disguised unemployment which is stressed in the literature on labour surplus economies. The mobilizable manhours of labour in a land surplus economy have a positive marginal product in agriculture; they are unemployed as a matter of conscious preference, at existing prices, for leisure and other 'unproductive' pursuits over material output. Their unemployment is not the result of their inability to raise material output with further increases in labour inputs. Rather, it is the result of deficient demand for their material output. The external manifestations of these two distinct types of mobilizable agricultural surplus - the stereotyped picture of men sleeping under trees or sitting idly around, are familiar; more important, though their explanations are quite different, they are identical."

This analysis is incorrect. Surplus labour is identical in form in the two types of economies, in both labour does not work harder because it is not worthwhile to do so. In neither economy is the marginal product of labour zero. Unemployment in both countries is only the result of 'deficient demand' in the sense that demand may influence price and thus how profitable to the worker is producing output.(5) It is such profitable opportunities which arguably distinguish rapidly growing poor countries such as Ghana from 1900-39 and India over the same period.(6)

So far we have only considered the static allocative outcome of the vent-for-surplus model. If the equilibrium conditions are fulfilled then there is no incentive to increase per capita output. We quoted earlier Caves' discussion of the growth mechanism implicit in the vent-for-surplus model by which the process of exploiting 'surplus' natural resources is one of eliminating a disequilibrium situation. We can now introduce the disequilibrium which occurred in the Ghanaian economy. This disequilibrium was the discovery or introduction of cocoa which, by raising the return to effort in this sector, induces a migration of resources - both labour, land and capital - to this sector. Insofar as these resources are drawn from 'surplus' resources total factor productivity will rise. It is in examining the consequences of this disequilibrium that the static model of equations (2.22) - (2.26) becomes a dynamic model of growth.

Thus the vent-for-surplus model examines the consequences for one sector of a disequilibrium from the static equilibrium of equations (2.22) - (2.26). We argue in chapter 4 that in the case of Ghana the disequilibrium arose because conditions (2.25) and (2.26) became,

$$\frac{P_X}{P_H} U_h \, X_{L_3} > V^X_{l_3} \qquad (2.25')$$

and

$$\frac{P_X}{P_H} U_h \, X_{K_3} > U_f \, F_{K_I} \qquad (2.26')$$

In words, the real return from effort and the real return on capital were greater in the cocoa sector than elsewhere in the economy. As a result of this disequilibrium factor, supply will flow from the H and F sectors into cocoa.

If domestically produced handicrafts and imported manufactures are close substitutes (as we have assumed in the formal model) then domestic production of handicrafts may disappear before the disequilibrium is eliminated. What happens to the food sector depends on the conditions surrounding equilibrium condition (2.23),

$$U_f \, F_{L_1} = V^F_{1_1} \tag{2.23}$$

The argument here is identical to the argument in Sen (1966). If the real cost of labour is constant, then migration from the sector will not lead to any fall in food sector output. We have already referred to the Hymer and Resnick (1969) model. Hymer and Resnick (1969) have argued that a decline in H occurred and that this implies the relevance of the neoclassical model of fully employed resources. As our model shows, the issue is more complicated than this and it is possible that H production declines due to being closely substitutable with imports and that F production does not, due to surplus labour hours in this sector. The decline or otherwise of H production does not distinguish the models.

If food production is constant, then due to the disequilibrium total factor productivity in the economy will be rising, i.e. output/capita is increasing. Once the disequilibrium is eliminated and the economy returns to a new equilibrium characterised by equations (2.22) - (2.26), growth can still continue due to population growth but this simply provides growth with constant per capita output.

We now wish to consider how the disequilibrium might be eliminated. Labour will flow into the cocoa sector from food and handicrafts. We can utilise the neoclassical framework originally due to Solow (1956) and applied to dual economy models by Findlay (1973). Our model differs from the original models in that it is a sectoral model not an aggregate model and the growth of the labour force is not given exogenously but is attracted from the traditional sector. In our model both labour and capital will be attracted to the export sector, while the disequilibrium conditions we have identified remain.

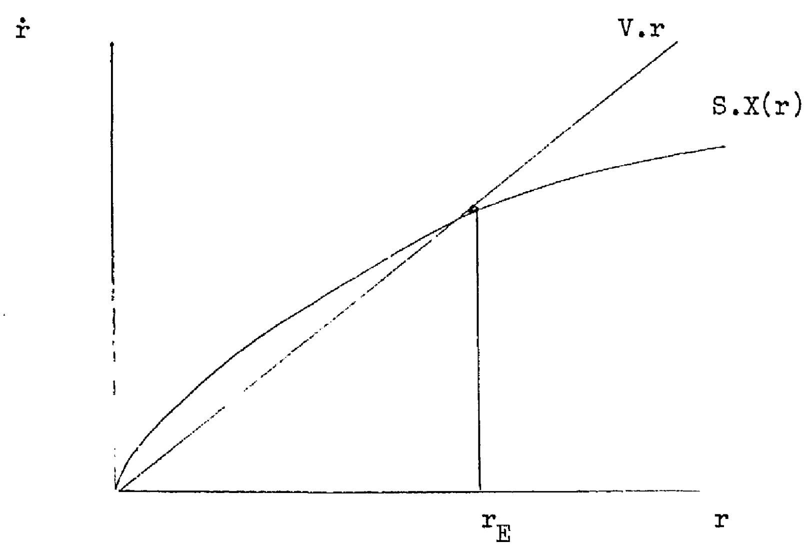



Diagram 2.1 Solow Diagram

Diagram 2.1 reproduces the Solow diagram for the neoclassical growth model where

$r$ = K/L for the cocoa sector (i.e. the export sector X)

$\dot{r}$ = rate of change of r

$r_E$ = equilibrium r

$V$ = populational growth + migration + labour augmenting technical progress.

$S$ = Savings rate.

By definition $K = rL = rL_0e^{vt}$. Solow (1956) shows that $\dot{r} = S.X(r) - V.r$ so that at $r_E$ in diagram 2.1 $\dot{r} = 0$.

In our use of this model the interest is in the factors that influence V and S. Within this framework we can formalise all the possible reasons for the decline of migration and saving inflows into the sector. These are:

1. The supply of labour from the food and handicraft sectors is exhausted. As the labour force in the food sector tended to zero a structural change for the economy would become necessary so that food would be imported. However, the exhaustion of labour would mean that real wages could no longer be fixed outside the sector and we would be back to the aggregate, single sector model.

2. The rate of return on investment elsewhere in the economy could rise, thus reducing S in the cocoa sector.

3. The land constraint becomes binding so that no further capital widening is possible. This is suggested by Findlay (1970).

4. The utility from handicrafts is diminished sufficiently given that $U_h' > 0$ and $U_h'' < 0$, such that the disequilibrium conditions (2.25') and (2.26') are eliminated and both V and S fall to zero.

5. The economy comes to occupy a monopoly position in world trade so that $P_X/P_H$ is shifted downwards. In terms of the diagram the production function would shift down.

6. $P_X/P_H$ shifts downwards due to aggregate demand reduction in export markets.

## 2.4 Implications of the Model

In this section we consider how the vent-for-surplus sector links with the total economy. The implications for the rest of the economy depend on how the income from the vent-for-surplus sector is spent. In particular, whether it is saved or consumed and whether the consumption is directed to the domestic sector or imports. To investigate these implications we have utilised the standard national income accounts which we now present.

Our theoretical model suggests that it is important to identify four sectors in the economy,

| | | |
|---|---|---|
| 1. | Exportables (palm oil, gold, cocoa, timber, etc.) | X |
| 2. | Importables (handicrafts, manufactures) | H |
| 3. | Non-traded (food, transport) | N |
| 4. | Government | G |

We shall denote these four goods as X, H, N and G.(7) A superscript S will indicate the amount supplied, while a superscript D will indicate the amount demanded domestically. Thus exports may be regarded as the difference between the supply of exportables and the demand for exportables, while imports are the difference between the demand for importables and the supply. In symbols we have,

$$\text{Exports} = X = P_X^D\,(X^S - X^D)$$

$$\text{Imports} = H = P_H^D\,(H^D - H^S)$$

We shall for the moment assume that the country is small relative to the world economy, so that the price of its imports and exports in foreign exchange is fixed. Domestic producers do not, however, face these world prices due to the system of indirect taxes on importables and exportables. These two aspects of the trade regime may be summarised in symbols as,

$$P_X^D = e.P_X^F\ (1 - t_X)$$

$$P_H^D = e.P_H^F\ (1 + t_H)$$

where $P_X^D$ , $P_H^D$ are domestic producer prices of exportables and importables, e is the exchange rate, $P_X^F$ , $P_H^F$ are the (fixed) world prices of the goods and $t_X$ , $t_H$ are the tax rates on exportables and importables respectively.

The output measure of GDP at factor cost, Y, is given by

$$Y = P_X^D\ X^S + P_H^D\ H^S + P_N\ N^S + P_G.G^S$$

The expenditure measure of GDP at factor cost, E, is given by

$$E = P_C.C + P_I.I + P_G\ G^D + P_X\ X - P_H\ H - T$$

where $P_C$ is the deflator for consumers expenditure C

$P_I$ is the deflator for investment expenditure I

$P_G$ is the deflator for government expenditure $G^D$

$P_X$ is the world price of exports in domestic currency

$P_H$ is the world price of imports in domestic currency

T is indirect taxes.

Abstracting from measurement problems the output and expenditure measures of GDP are identical:

$$Y \equiv E$$

The expenditure definition of GDP can be written,

$$E = P_C.C + P_I\ I + P_G\ G^D + P_X(X^S - X^D) - P_H(H^D - H^S) - T$$

$$= P_C.C + P_I\ I + P_G\ G^D + P_X\ X^S + P_H\ H^S - P_X\ X^D - P_H\ H^D - T$$

If taxes on trade are the only form of taxes and there is public sector equilibrium, we will have,

$$P_G . G^S = P_G G^D = T$$

and $$T = P_X t_X (X^S - X^D) + P_H t_H (H^D - H^S)$$

$$E = P_C . C + P_I I + P_G G^D + P_X X^S + P_H H^S - P_X X^D - P_H H^D$$

$$- P_X t_X X^S + P_X t_X X^D - P_H t_H H^D + P_H t_H H^S$$

$$= P_C C + P_I I + P_G G^D + (P_X - P_X t_X) X^S - (P_X - P_X t_X) X^D$$

$$+ (P_H + P_H t_H) H^S - (P_H + P_H t_H) H^D$$

But $P_X^D = (1 - t_X) P_X$

and $P_H^D = (1 + t_H) P_H$

$$E = P_C C + P_I I + P_G G^D + P_X^D (X^S - X^D) + P_H^D (H^S - H^D)$$

When taxation is exclusively indirect taxation on imports and exports we have two equivalent definitions of expenditure GDP at factor cost

$$E = P_C . C + P_I I + P_G G^D + P_X X - P_H H - T \quad \text{or}$$

$$E = P_C C + P_I I + P_G G^D + P_X^D X - P_H^D H$$

In chapter 4 we measure GDP at market prices, thus implicitly using world prices for exports and imports if indirect taxation takes the form exclusively of taxes on imports and exports. Such a measure of GDP accords closely with Mirrlees (1969) concept of potential national income.

$Y \equiv E$ is an identity. This identity can be used to construct a theory of the open economy by making it possible for $Y \neq E$ and for a balance of payments disequilibrium to emerge. $Y = E$ is then a condition for balance of payment equilibrium if there is equilibrium in the non-traded and government sectors. To see this note that

Domestic Income $= Y = P_X^D X^S + P_H^D H^S + P_N N^S + P_G G^S$

Domestic Expenditure $= P_C C + P_I I + P_G G^D$

By definition $P_C C + P_I I = P_X^D X^D + P_H^D H^D + P_N N^D$

If domestic income = domestic expenditure

then $P_X^D (X^S - X^D) + P_X^D (H^S - H^D) + P_N (N^S - N^D) + P_G (G^S - G^D) = 0$

If there is equilibrium in the non-traded and government sectors then,

$N^S = N^D$ and $G^S = G^D$

Therefore $P_X^D (X^S - X^D) = P_X^D X = P_X^D (H^D - H^S) = P_H^D H$

i.e. the balance of payments is in equilibrium.

This theory of what determines the balance of payments equilibrium is termed the absorption approach to the balance of payments. This theory is to be distinguished from the theory underlying the elasticities approach in which a balance of payments disequilibrium may be alleviated by export growth which in turn depends on elasticities of demand. The elasticity approach assumes unemployed resources in the Keynesian sense of the term.

Both the absorption and the elasticity approach are concerned with balance of payments problems in short run analysis. In long run analysis how much of any income gain is saved and how profitably it is invested determines the growth of the economy. The open economy model which we outlined in chapter 1 uses the elasticity approach to analyse long period problems. Thus the open economy model would be correct if there were no growth and Keynesian unemployed resources. How well this model fits the data is considered in chapter 4. The implication of the vent-for-surplus model is that with public sector and non-traded sector equilibrium there will be no balance of payments deficit.

Finally we consider the implications for measures of GDP of relaxing the assumption that $P_X/P_H$ was constant. We have already argued the importance of changing terms of trade for the growth process in Ghana. Following the procedures of Summers, Kravis, Heston (1980) we term the value of output allowing for terms of trade effects, gross domestic income (GDY) while using the term gross domestic product (GDP) to refer to the constant price output series.

We conclude this section by summarising the implications of the vent-for-surplus model which we test in chapters 3 and 4. In section 2.3 we argued that the model assumes surplus land (i.e. $\lambda_2 = 0$) and surplus labour hours. Growth is a disequilibrium process caused by a rise in the relative price of exportables. While growth occurs exports will rise until the disequilibrium is eliminated. While this is occurring we expect to observe a long run downward sloping supply curve for exports. Increased factor supply occurs in conditions of zero productivity change within the sector.

If surplus labour hours in the food sector are associated with a constant 'real cost of labour' then food output will not fall. The long run equilibrium growth of the vent-for-surplus sector is zero and two factors which may reduce the growth rate to zero are the exhaustion of surplus land or the lowering of the return to effort. It is these two explanations we will be primarily concerned with investigating.

In this section we have derived a framework using the GDP accounts to measure the aggregate growth of the economy. This we need to do in order to see how far growth in the vent-for-surplus sector is associated with growth for the whole economy. We have derived measures for GDP which, if taxes are primarily indirect taxes, closely measure Mirrlees' definition of potential national income. We have argued that the vent-for-surplus model is consistent with the absorption approach to the balance of payments. In contrast, the 'open economy' model of Seers, which we discussed in chapter 1, implicitly used the elasticity approach to the balance of payments. These monetary aspects are of considerable importance as the implications are quite different between the two models. The implication of the Seers model is that high growth rates will be associated with balance of payments deficits while the vent-for-surplus model predicts the opposite in a fixed exchange rate regime with no autonomous money creation institutions.

# Chapter 3. Productivity and Factor Inputs into Ghana's Cocoa Industry, 1900-1975

## 3.1 Introduction

In the final section of chapter 2 we considered the implications of the vent-for-surplus model of growth. This model is applicable to a sector of the economy, not to the economy as a whole and for Ghana the sector is cocoa. In this chapter we are concerned to test three aspects of the model. The first is whether 'surplus' land existed, the second is whether the disequilibrium implied by a vent-for-surplus growth process was ended by the exhaustion of 'surplus' land, and thirdly we propose to investigate the view put forward by Myint that growth did not involve substantial changes in productivity within the new sector.

To test these propositions it is necessary to examine land and labour inputs into the cocoa industry in some detail and that is the purpose of this chapter. Earlier attempts to explain the causes of the pattern of output growth of Ghanaian cocoa, Ady (1949), (1968), Bateman (1965), (1969), (1974), have all had to relate output to price of cocoa and its substitutes as cocoa acreage data were lacking. The lack of data on acreage has also meant that both the level and the rate of change of land productivity have been assumed either unknown or estimated very roughly. In 1970 there was the only attempt in Ghana at an agricultural census and that was based on a sample which we will argue in section 3.3 led to a substantial underestimate of acreage. Thus, direct time series of cocoa acreage clearly are unobtainable. However, as part of a disease control programme, two (almost) comprehensive surveys of Ghana's cocoa acreage have been made, one in the period 1949-55, the second in the period 1970-78. These data were collected solely with a view to controlling, and eventually eradicating, swollen shoot virus (SSV), a disease which has gravely damaged Ghana's cocoa industry. We have attempted to use the data arising from these surveys to measure both cocoa acreage and productivity over the whole period since 1925. If such an exercise were possible, and the quality of the data ensure that doubts will always remain, then the result would represent a major extension of our knowledge of the Ghanaian economy in the twentieth century as well as enabling us to test formally the implications of the vent-for-surplus model.

The evidence of the surveys gives macro information about land area. Numerous micro studies of individual farms have also been carried out in various parts of Ghana at different periods. These micro studies apart from providing an invaluable check on the macro evidence, also give additional insights into labour use, and the seasonality of labour demand and supply. These micro studies enable a reasonable estimate to be made of labour hours input per acre. Thus with our estimate of total acreage we can estimate total labour input, which can then be checked with the population census data. This integration of macro and micro evidence enables us to represent the cocoa production function, i.e. cocoa output as a function of land and labour inputs. This function, which we derive in section 3.3, is a stylised representation of the facts not, as in other work on agricultural production functions, a statistically estimated equation.(1) However, as we have argued in chapter 1, such an approach represents a valuable insight into the sources of growth and although only a stylised representation of the data, we would argue that such a production function is a useful framework to examine the major issues of this chapter.

We begin in section 3.2 by examining the micro evidence of farm studies. We consider the available evidence for labour inputs per acre and note the large productivity differences which exist between experimental work and average practice. In section 3.3 we use the evidence of the surveys to measure land productivity in 1955 and 1975 and the planting data to construct a time series of land productivity. We then use the micro evidence of section 3.2 to derive an aggregate measure of labour productivity. Inferences as to how labour productivity has changed over time can then be drawn.

Section 3.4 uses the data of earlier sections to show that 'surplus' land has never been exhausted by Ghana's extensive growth pattern. The evidence of other micro studies is summarised to indicate that the peasant producer has always preferred extensive to intensive growth. The reasons for this preference and its rationality are examined in chapter 5, while chapter 6 considers the implications for technical progress.

## 3.2 Productivity and the Economics of Farm Size

### 3.2.1 Introduction

In this section we examine, in the context of the traditional cocoa production process, the pattern of labour and land productivities which have been observed on cocoa farms of varying size and age.

We begin by considering the labour allocation decision of the household assumed to comprise the male head, wife (or wives) and children. The initial decision is of the location of the labour supply, depending on the supply of cocoa land and the spread rate of technical knowledge of the techniques of cocoa growing. Once the location of labour supply decision has been made and cocoa growing commenced, the next decision required is to allocate the family labour time between (a) establishing a new farm, (b) maintaining young, non-bearing farms, and (c) maintaining, improving and harvesting bearing farms. The next, clearly interdependent, decision is how much labour to hire for each of these activities and on what terms. If a decision is made, over a period of time, to invest labour in each of these activities, the farmer will come to own three types of farm: new, non-bearing and bearing. These types constitute a holding and, in Ghana, they would not normally be spatially contiguous.

Labour inputs into establishing a new farm are a form of investment; the extent of these inputs and how they complement or compete with alternative uses of the farmer's time are important elements in the costs of establishment for the cocoa farm. The reduction of these costs increases the return on cocoa investment, whilst the reduction in harvesting costs increases current profit. Thus in section 3.2.2 where new cocoa farms are examined we are considering investment costs, while in section 3.2.3 where labour and land inputs for bearing farms are considered, we are investigating production costs. It is the data from section 3.2.3 which provides the basis for the stylised production function of section 3.3.2.

### 3.2.2 New Cocoa Farms

We now consider in detail the inputs necessary for creating a new cocoa farm. The traditional method of planting cocoa is under cleared secondary forest, which provides the necessary shade. Food crops are interplanted with the cocoa and harvested until the cocoa is established. The farm is then abandoned until the cocoa comes into bearing. This method is described in detail by Hammond (1962). The materials required for planting would be beans from pods planted at stake, each purchased pod would supply some ten trees. It is believed that in the traditional production process, trees would be very densely planted, at least initially, possibly in excess of 3000 trees/acre, i.e. at spacings of approximately 4' x 4'.

Okali (1975) has brought together data on labour inputs for establishing new cocoa farms which we reproduce in table 3.1. The figures from Beckett (1947) relate to the 1930s. Those of Rourke (1974), Okali (1974), (1975) and Cocoa Division (2) relate to the 1970s. The other figures relate to the 1960s or earlier. It is striking that the labour input estimates differ widely. The discussion of these competing figures has concentrated on which is 'correct', Kotey, Okali, Rourke (1974: 69). This discussion has confused two separate points. One is which figure represents the average or most common production technique. The other is whether, for a given production technique, the figures are accurate. Clearly the production processes implied by the figures are dissimilar and these two questions are quite distinct.

The lowest labour input figures, those of Beckett, come closest to describing the production process outlined by Hammond (1962). The largest numbers, those of the Cocoa Division, Rourke and Okali, describe a much more costly method involving felling and clearing. Beckett's figures, in excluding these activities, cannot be regarded as representative of the average production process. Similarly, the Lanfranchi numbers also refer to a case study where felling was relatively cheap. The bulk of the difference between Okali and Rourke's figures are to be found in the weeding and planting categories. Much of the weeding is done by hired workers and Okali (1975: 26) notes that due to lack of direct data "in making calculations for both temporary and permanent hired workers the average time worked by all other members of the permanent labour force was used as the norm". Clearly this procedure could result in a large overestimate of number of hours worked. The weeding figure of Okali is further suspect as Rourke (1974: 22) assumes "a high level of maintenance expenditure in the form of spraying, weeding and brushing" as he assumes relatively high yields.

Table 3.1 Man Days per Acre per Year Spent on Establishing a Cocoa Farm

| | Beckett (1) | Ministry of Agriculture: Cocoa Division (1) | Ministry of Agriculture: Cocoa Division (2) | Ministry of Agriculture: Economics & Marketing Division | Lanfranchi | Rourke | Okali |
|---|---|---|---|---|---|---|---|
| 0-12 months | | | | | | | |
| Clearing | 2.5 | | 10 | 26 | 6 | 10 | 9.7 |
| Felling | | 43 | 8 | | 10 | 19 | 7.4 |
| Burning | | | | | | 1.5 | 1.1 |
| Apam | | | 12 | | | 8 | 11.2 |
| Lining and pegging | | 9 | 9 | 7 | | | |
| Planting cocoa | 7.5 (seed) | 9 (seedling) | 9 | 4 (seed) | 8 (seed) | 12 (seedling) | 19.8 |
| Planting Plantain | | 15 | 3 | 14 | 16 | 10 | 6.6 |
| Harvesting food | 0.6 | | 1 | | | | |
| Weeding | 13.2 | 4 | 8 | 6 | 4 | 16 | 35.7 |
| Other maintenance | | 8 | | 1 | | 0.5 | |
| Planting other food | | | | | | 6 | 19.8 |
| Other | | | 28 | | | | 3.7 |
| Total | 23.8 | 88 | 88 | 58 | 44 | 83 | 115 |
| 13 months-full bearing | | | | | | | |
| Weeding | | | 44 | | | 21 | 30.4 |
| Other maintenance (filling) | | | 18 | | | 1.5 | 0.3 |
| Cocoa harvesting | | | 6 | | | 1.0 | 0.2 |
| Food cropping | | | 23 | | | 37.5 | 1.1 |
| Spraying | | | | | | | 1.4 |
| Total | | | 91 | | | 61 | 33.4 |

Source: See Table 3.3.

In fact, Rourke's low yield assumption is of a yield of 600 lbs/acre, which is nearly twice the actual yield obtained by Okali's group of farmers. Thus Okali has far greater inputs of labour producing far less output. We conclude that Rourke's estimates for labour time in weeding are the more reasonable. The other major difference between Okali and Rourke is that Okali includes 19.8 man days/acre for planting food other than plantain as against Rourke's figure of 6 man days. This difference may in part reflect different production processes for Okali; however, despite the large input of labour allocated to planting the food, the labour input for food cropping is negligible. It seems clear overall that Okali's numbers are an overstatement of normal or average labour inputs for establishing cocoa acreage.

Considering simply labour inputs in planting cocoa (i.e. lining and pegging and planting in table 3.1) the man days per acre per year range from a minimum estimate of 7.5 (using seed) to a maximum of 20 with an average of 10. These differences clearly flow from the use of different production techniques. Further evidence on this point and results which shed light on the economics of plant density is to be found in Bonaparte (1966).

Bonaparte (1966) has estimated the costs, in 1966, of planting beans at stake as a function of plant density and his results are reproduced in table 3.2. The labour costings in table 3.2 are based on assuming a wage of 6s 6d/man day which was approximately the minimum wage (Appendix Table 11). The costings imply that a four-fold increase in cost gives a five-fold increase in the number of trees, i.e. the cost/tree planted falls with increasing density. Table 3.2 also shows that trees planted per man day at high densities are some 30 per cent greater than at low densities. These figures suggest an interpretation of part of the divergences shown in table 3.1, namely that they refer to different densities of planting. Such an interpretation would be consistent with the relatively high densities of planting which characterise the traditional production method.

Two technical aspects of cocoa planting are of importance for understanding the rationale for this <u>investment</u> process. The first is that cocoa is subject to insect attacks - capsids - the incidence of which increases with lower density planting as canopy coverage is slower and capsids benefit from light. Thus the initial dense planting minimises the risk of insect attack. The second is that high density planting allows for a large failure rate and thus allows for a low level of maintenance inputs.

Thus the traditional production process in planting has as its economic objectives substituting labour for capital, dense planting rather than insecticides and using labour and land intensively relative to capital inputs. Finally, in considering labour inputs necessary for maintaining the farm until it comes into bearing, table 3.1 shows a range of numbers from 28 man days per acre to 91 man days per acre. The lowest number, that of Okali, is clearly in error due to its omission of food cropping while that of the Cocoa Division is clearly what they regard as best practice and implies an input far greater than that actually achieved. Rourke's figures again appear the most reasonable.

Table 3.2 Cost of Planting at Four Different Spacings

| Spacings | 4' x 3' | 4' x 4' | 8' x 6' | 8' x 8' |
|---|---|---|---|---|
| Planting Materials (£/acre) | 1.8 | 1.4 | 0.5 | 0.4 |
| Labour Costs (£/acre) | 4.1 | 3.3 | 1.2 | 1.1 |
| No. of trees/acre | 3645 | 2734 | 911 | 683 |
| Man Days/Acre | 12.6 | 10.1 | 3.7 | 3.4 |
| Trees Planted/Man Day | 289 | 271 | 246 | 201 |

Source: Bonaparte (1966).

### 3.2.3 Maintenance and Harvesting of Bearing Cocoa Farms

In this section we consider the labour and land inputs for bearing cocoa farms, i.e. we consider production costs as distinct from the investment costs of section 3.2.2. The land input is not solely acreage under cocoa as plant density affects both yields/labour hour and yields/acre. Experiments at Tafo to investigate this relationship are reported by Bonaparte (1966), (1974). These trials result in much higher levels of productivity than the traditional production process. Here we assume that the relationship between labour and land productivity is invariant to the level of productivity and thus will throw useful light on the economics of the traditional production function. We begin by considering labour inputs for the maintenance and harvesting of farms compiled by Okali (1975) and reproduced in table 3.3.

Table 3.3 Man Days per Acre per Year Spent on Bearing Cocoa Farms

| | Beckett (1) | Beckett (2) | Rourke | Okali |
|---|---|---|---|---|
| Weeding | 8.2 | 5.2 | 7 | 9.7 |
| Other Maintenance | 0.6 | 7.9 | 0.5 | 1.5 |
| Cocoa Harvesting | 17.0 | 15.8 | 7.0 | 12.1 |
| Planting and Harvesting Food | | | | 0.5 |
| Total | 25.8 | 28.9 | 14.5 | 23.8 |

Sources for tables 3.1 and 3.3.

These tables are a compilation from Okali (1975, Tables A.1 and A.4), Beckett (1972) and data direct from the Cocoa Production Division. The originals of Okali Table A.4 and other sources are given below:- Beckett (1): Beckett (1947: 80-81, 93); Beckett (2): Beckett (1972: 12); Cocoa Division (1): Okali Table 2.4, unpublished data; Cocoa Division (2): Given to author by Cocoa Division, unpublished data, 1981; Economics and Marketing Division: Okali Table A.4, unpublished data; Lanfranchi: Lanfranchi (1962: 66-74); Rourke: Rourke (1974, Appendix Table III); Okali: Okali (1975, Table A.1).

In considering labour inputs for full bearing farms the similarity of Beckett's and Okali's figures is striking. It appears that in this area Rourke has underestimated labour input requirements. To investigate levels of productivity further it is necessary to assess how levels of labour inputs/acre vary with farm size. There are reasons advanced by Bauer (1948) and Sen (1962), (1975) why land and labour productivities will differ systematically depending on farm size. Bauer in his study of rubber in South East Asia observed that small holder rubber farms were more densely planted than plantations with the result, given the technical conditions of growing rubber, that yields/labour hour were higher on plantations than on small holder plots, while yields/acre were higher on small holdings. Bauer explained this observation by arguing that as the bulk of the labour supply to the small holder was family labour, the small holder was economising on his scarcest input, land, whereas the plantation, employing wage labour, could not economically work its plantations as intensively on a yield/labour hour basis. Sen (1962), (1975) has extended this result to suggest that as farm size rises, output/acre would fall and output/labour hour would rise.

Two studies of cocoa, one in Nigeria and the other in Ghana, provide data to support the general Bauer-Sen contention for West Africa, that of Okali (1975) and Galletti, Baldwin and Dina (1956) whose results are reproduced in table 3.4(a). The data collected by Okali (1974), (1975) refer to Ghana of "cocoa farms located at Dominase, fourteen miles north-west of Mim, Brong-Ahafo", Okali (1974: 4). The survey was carried out in the early 1970s. The Nigerian data were collected as part of a comprehensive study of Nigerian cocoa farming in the early 1950s.

The figures are clearly consistent with the Bauer-Sen hypothesis. For Nigeria, a tripling of average farm size is associated with an approximate tripling of labour productivity and a 30 per cent decline in land productivity. A similar pattern is observable for Dominase, the larger percentage changes being presumably the result of the small sample size.

The relationship between productivity and farm size can be further investigated by examining the inputs for farmers and caretakers' farms. Okali (1974) notes that "as the work load increased the number of hired permanent workers also increased. Annual labourers were hired to assist on new farms". A 'caretaker' is the name given to a share cropping arrangement whereby the caretaker usually takes one third and sometimes up to half of the crop. Okali's data further show that the average size of bearing farms operated by caretakers is twice that operated by farmers themselves. Table 3.4(b) reproduces Okali's results comparing caretakers and farmers' farms. The caretaker acreage is clearly worked less intensively, yielding higher yields/man day and lower yields/acre. Okali's data show that on bearing farms approximately one third of the total work devoted to harvesting cocoa is supplied by caretakers, Okali (1975: 49). Other farmers are the largest single labour input, supplying 37.2 per cent of total labour input. The evidence clearly suggests that large farms have higher land/labour ratios.

We have shown that the data from both Nigeria and Ghana is consistent with the Bauer-Sen hypothesis. The implication is that land and labour productivities differ due to different factor prices facing firms of various size. What, however, of the technological relationship between land and labour, in particular the effects of different plant densities? Experiments at Tafo have been reported by Bonaparte (1966).[2]

Table 3.4(a) Relationship between Labour Hours, Acreage and Production on Bearing Farms

| | Range of labour hours per acre | | |
|---|---|---|---|
| | 76 to 150 | 151 to 300 | 301 to 600 |
| Nigeria | | | |
| Number of Families | 16 | 21 | 12 |
| Average Acreage | 6.2 | 5.7 | 1.9 |
| Yield/hour (lbs) | 2.25 | 1.5 | 0.85 |
| Yield/acre (lbs) | 276 | 309 | 381 |
| Dominase | | | |
| Number of Farms | 3 | 6 | 1 |
| Average Acreage | 35.1 | 12.8 | 4.0 |
| Yield/hour (lbs) | 2.25 | 1.6 | 1.1 |
| Yield/acre (lbs) | 274 | 342 | 599 |

Source: Okali (1974: Table 5).

Table 3.4(b) Relationship between Yields on Caretakers' and Farmers' Farms, Dominase, 1971/72

| | Caretakers' Farms | Farmers' Farms | All Bearing Farms |
|---|---|---|---|
| Total Man Days per Acre | 16.0 | 32.5 | 23.8 |
| lbs dry cocoa per acre | 282 | 384 | 348 |
| lbs dry cocoa per man day | 20.3 | 12.8 | 17.5 |
| Total Acreage | 145.9 | 40.5 | 186.4 |
| Average Acreage | 24.3 | 10.1 | 18.6 |

Source: Okali (1975: Table 5.1, p.62 and Table 5.2, p.69).

> "The harvesting rates at each of the eight spacings of the Amelonado Spacing Experiment (J1) at Tafo were studied during the 1963/64 harvest season. The cocoa trees at the closer spacings have tall, thin trunks, with little development of the fan branches, and usually bear a higher proportion of the crop on the trunk. Those at the wider spacings have short, thick trunks, with well developed branches, and usually bear a higher proportion of the crop on the branches. This contrast in habit of growth affects the harvesting rates of cocoa pods at these spacings. The difference in harvesting rates between spacings was significant at the 0.1 per cent level. More pods were picked per unit of time at the closer spacings than at the wider spacings. The number of pods picked per unit time at each spacing was converted to pods/man-day on the basis of a 6-hour day."
> [Bonaparte (1966)]

The relationship between plant density and yields/acre have also been the subject of trials at CRIG and are summarised by Bonaparte (1974). Eight spacings were included in the experiment, ranging from 4' x 4' (2722 trees/acre) to 15' x 15' (192 trees/acre).

> "A study was made of the yields of this experiment from the 9th year (when yields first exceeded 200 lbs per acre) to the 16th year (1963/64). The yield/plant population relationship was described by a simple parabola, deviations from the quadratic curve being non-significant. The yields over the eight years under study were grouped into four 2-year periods, and a quadratic curve fitted for each period. Over the first three periods, there was a gradual shift of yield optima from the closer to the wider spacings, as would be expected of trees more fully exploiting the available environmental resources, the optima being respectively 45, 56 and 77 sq. ft. per tree and a shift back to 45 sq. ft. per tree in the final period when the wider spacings suffered from insect attack."
> [Bonaparte (1974: 75-76)]

An earlier experiment carried out on Amelonado in Nigeria, Kowal (1959) also showed an optimum plant density of about 800 trees/acre.

Chart 3.1(a) (page 72) depicts the technical relationship between plant density and yields/acre and yields/man day. The technical differences between the rubber and cocoa industries is apparent. For rubber, dense planting maximises yield/acre whereas for cocoa dense planting maximises yield/man day. Thus simply considering plant density in relation to productivity we would expect large farms to be more densely planted than small ones. The evidence on this point is very limited.

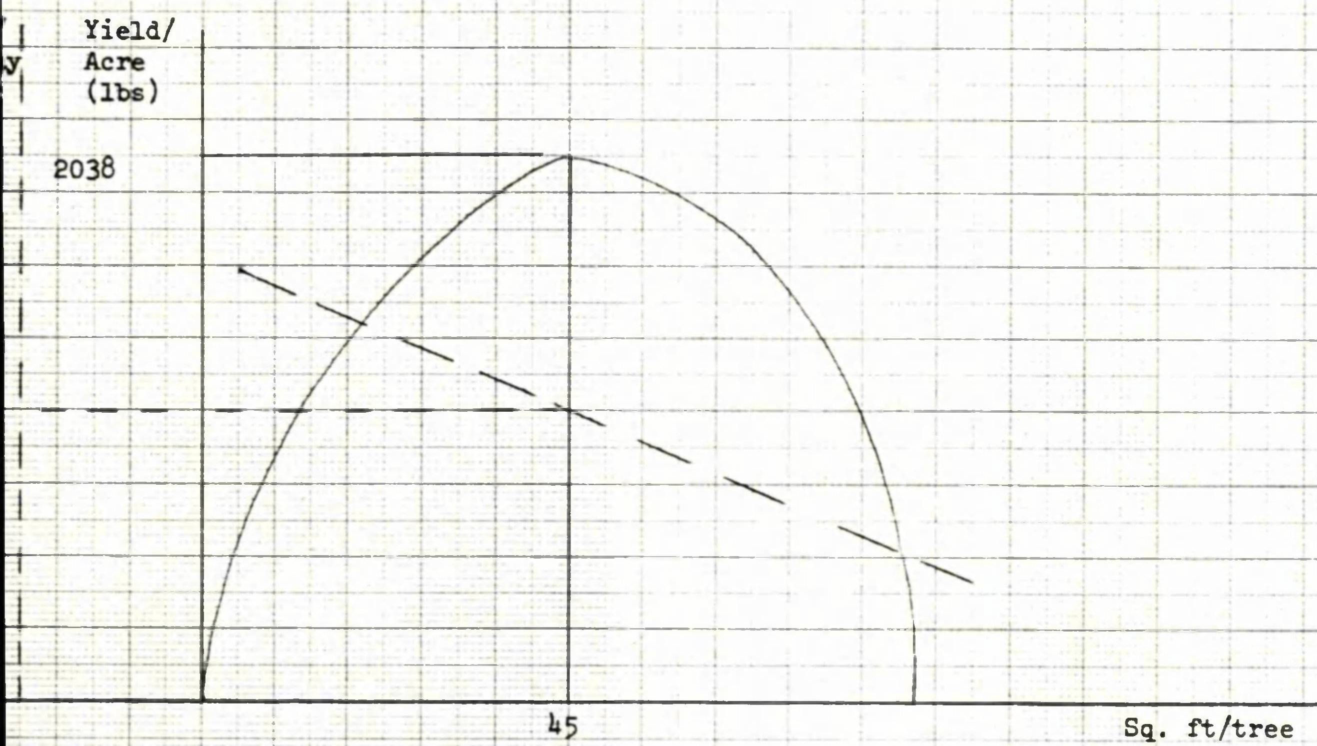
Okali (1975: 106) notes that "seedling counts on farms at Dominase made 22 months after initial planting beans at stake gave estimates of 2000 seedlings per acre, giving a spacing of roughly 4' x 4'. Farmers reported that at this spacing, and with the low seedling height at first weeding, the operation became almost a hand process." Beckett (1972: 19) in his study of Koransang finds an average of 393 trees/acre, a very low figure, presumably due to trees losses from the progress of the swollen shoot virus. Galletti, Baldwin, Dina (1956: 673-4) find means of areas which range from a minimum of 390 trees/acre to a maximum of 870 trees/acre.

Chart 3.1(b) represents the information from Okali already referred to. It appears from Okali's study that for farms farmed by their owner the bulk of the labour is family labour. For these farms yields/acre will be the major concern. The evidence on trees/acre from Galletti, Baldwin, Dina (1956) is consistent with farmers choosing a density consistent with optimal yields/acre. We have already noted that very dense initial planting is necessary to protect against insect attack. The evidence from Bonaparte (1966) on harvesting rates is clearly consistent with the interpretation that yields/man day are not the primary concern for peasant farmers.

A final point to emerge from chart 3.1 is that the yields both per acre and per man hour for the Tafo experimental results are many times those obtained by the traditional production process - a factor of 15 times in the case of output/man day and six times for output/acre. The implication of this divergence between experimental results and those achieved by small scale farmers will be considered in chapter 6. Next we must consider the macro evidence for acreage under cocoa.

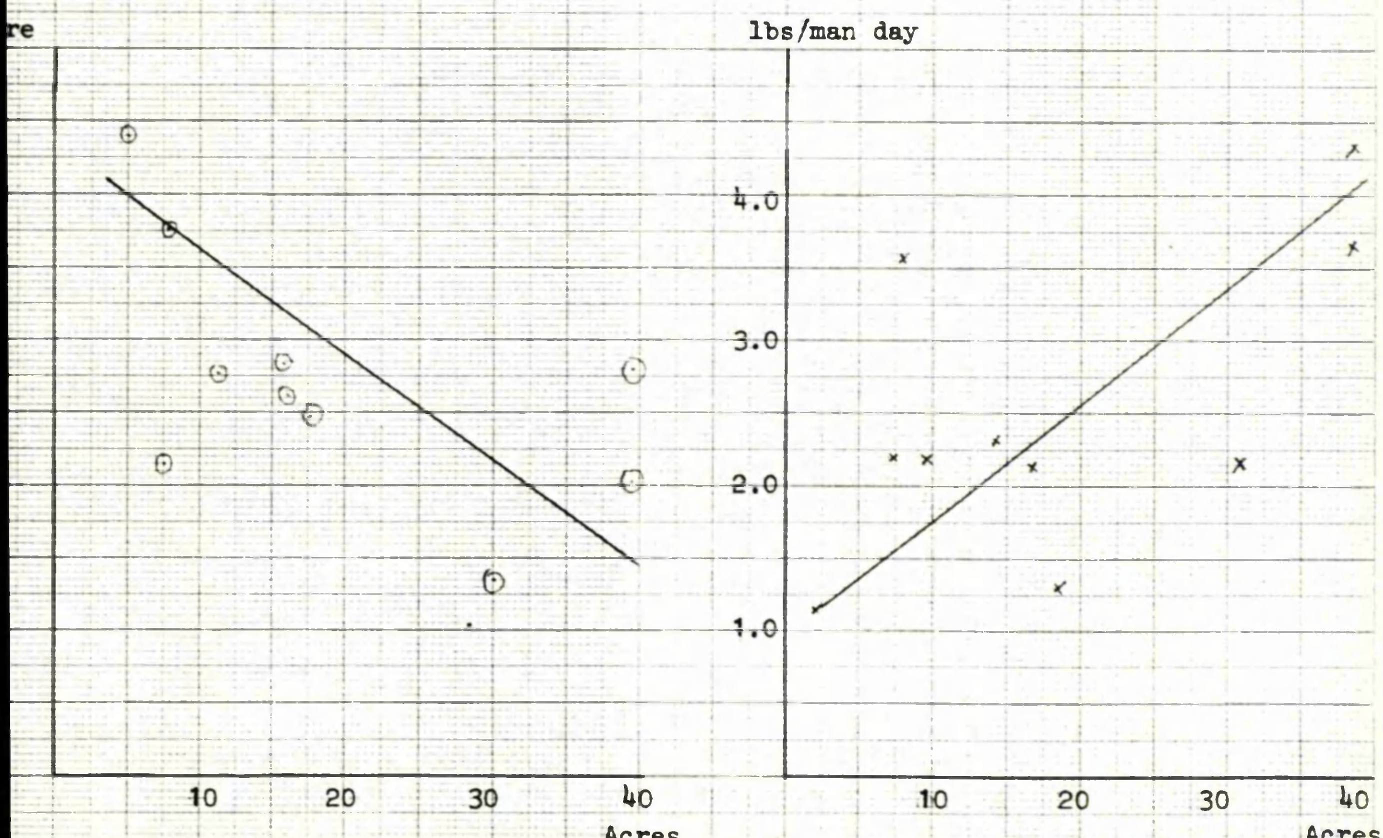
Chart 3.1 Productivity, Plant Density and Farm Size

3.1(a) Tafo Experimental Results




Source: Bonaparte (1966) (1974)

3.1(b) Producer Yields and Farm Size




Source: Okali (1975: Table 5.2)

## 3.3 Productivity Growth, Land Area, Labour Inputs

### 3.3.1 Ghana Cocoa Acreage and Land Productivity

In this section we consider cocoa acreage and land productivity. In section 3.3.2 we will consider labour inputs and labour productivity. Table 3.5 reports the data on acreage and yield available from the only comprehensive agricultural census carried out in Ghana. This census was a sample census conducted in 1970. Prior to that date agricultural data were based on annual sample surveys which were regarded as inadequate.

> "No adequate frame existed for the small holding surveys between 1965 and 1969. The sample design involved the selection of a sample of localities within the 1960 Population Census Enumeration Areas, with sub-sampling of holders within the selected areas. The 1960 Population Census list of enumeration areas provided a badly out of date frame for this exercise and, in addition to this, the selected areas for the agricultural surveys were in many cases only portions of the localities within the Population Census Enumeration Areas. The production of national or regional estimates from the sample data was rendered difficult by this lack of an adequate frame and, arising from this, the uncertainty concerning the true number of agricultural holders in Ghana."
> [Ghana (1972: 1)]

Despite the attempts to improve on earlier procedures there is evidence that the sample census figures for cocoa underestimated the area under cocoa. The evidence for this comes from detailed surveys of the cocoa growing areas carried out as part of a renewed attempt to control swollen shoot disease in the early 1970s. This survey, which commenced in 1970, continued throughout the 1970s and was organised on identical principles to the first survey of Ghana's cocoa growing areas begun in the late 1940s. Thus not only do we have a check on the 1970 census estimate, but we have the opportunity to compare both cocoa acreage and 'average' productivity in the 1950s with the 1970s. We therefore begin with the 1950s data because the concepts developed for this study were carried over unchanged to the 1970s study, both studies being the result of attempts to control swollen shoot.

This disease was discovered late in the 1930s, and acted as the major impetus to the establishment of systematic research on cocoa in Ghana and other West African countries. It was soon established that swollen shoot was caused by a virus which seriously damages the cocoa plant. This virus is believed to have originated from forest trees occurring throughout the cocoa growing areas. Once infected, a cocoa tree can provide a source of infection for surrounding cocoa trees, as the virus is carried by an insect known as a mealybug. It appears that as the virus spreads from cocoa trees to other cocoa trees it becomes more virulent, causing the rapid death of infected trees. It is this feature of the disease which ensured that an area in the Eastern Region located around Koforidua had most of its cocoa destroyed by the virus.

An officially organised campaign to control the disease began in the late 1940s. The only method of disease control available then (and now) was to cut out infected trees and destroy them to prevent the virus spreading. This method of disease control necessitated a survey of the whole cocoa growing area although initially excluding the area of the Eastern Region known as the 'devastated area' where the cocoa had already been destroyed. An account of the early progress of the campaign can be found in Tanburn (1953) and the Reports of the Cocoa Conference which were held annually in London from 1945 until the early 1960s. Tanburn (1953) states that "the primary object of the (Cocoa) Division's work are to survey the cocoa producing areas of the Gold Coast, to locate where cocoa is grown, and where swollen shoot disease is present, and to effect treatment to bring the disease under control".

Table 3.5 Cocoa Acreage and Productivity 1970

| Region | Area under Cocoa (Acres) | | | Number of Holders | Area Cocoa per Holder | Output thous. ton | Output per acre lbs/acre | Output per Holder |
|---|---|---|---|---|---|---|---|---|
| | Pure | Mixed | Total | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Western | 289,000 | 92,000 | 381,000 | 40,200 | 9.5 | 30.7 | 180.5 | 1710.6 |
| Central | 200,000 | 70,000 | 270,000 | 42,100 | 6.4 | 54.4 | 451.3 | 2894.4 |
| Eastern | 387,000 | 170,000 | 557,000 | 68,800 | 8.1 | 68.3 | 274.6 | 2223.7 |
| Volta | 121,000 | 24,000 | 145,000 | 27,700 | 5.2 | 20.5 | 316.7 | 1657.8 |
| Ashanti | 911,000 | 802,000 | 1,713,000 | 77,600 | 22.1 | 123.5 | 161.5 | 3564.9 |
| Brong Ahafo | 299,000 | 222,000 | 521,000 | 36,200 | 14.4 | 113.6 | 488.4 | 7029.4 |
| Total | 2,207,000 | 1,380,000 | 3,587,000 | 292,600 | 12.3 | 411.0 | 256.7 | |

Sources: Columns 1-5 Economics and Marketing Division, Ministry of Agriculture, Ghana; Report on Ghana Sample Census of Agriculture 1970 Volume 1, Accra, March 1972, Tables IX.1 and IX.4. Column 6 Bateman (1974, Table A1).

A later Tanburn study arose "when a preliminary investigation was carried out to see what additional use could be made of the vast masses of data collected by the Cocoa Division of the Gold Coast Department of Agriculture during their routine work of locating and treating outbreaks of swollen shoot". Tanburn (1955: 4)

Although, as Tanburn notes, the use to which the data was put was not that intended in its collection, "nevertheless, the mass of data collected is such that every possible use should be made of it despite inaccuracies. There is no better source, and no other data as complete, on land utilisation in the Gold Coast, and the use of mechanised tabulation has resulted in a more thorough summary of Intensive Survey data than had previously been possible." Tanburn (1955: 4)

Tanburn's objective in adapting the data was primarily as a means of making crop forecasts. Our interest is different. We wish to use the data for two purposes, first to obtain an estimate of acreage productivity and, secondly, to obtain an estimate of the total area under cocoa. Before we can do either, however, we must note the important distinction between <u>surveyed</u> acreage and <u>estimated</u> acreage.(3)

At the time of the study all cocoa acreage had not been surveyed, thus Tanburn's study is based on estimates for those areas where surveys had still to be carried out. In table 3.6(a) we present <u>surveyed</u> acreage and in table 3.7(a) <u>estimated</u> acreage. The importance of the distinction is immediately apparent as estimated total acreage is 34 per cent higher than the survey total. The three regions where estimates are of importance are, in descending order of importance, Western, Brong-Ahafo and Central. For the moment we proceed with both sets of figures to derive Tanburn's measure of productivity for acreage standardised for age and condition. We stress the distinction between surveyed and estimated area as our final measure of cocoa acreage is much larger than other measures. To justify our conclusion we must therefore justify Tanburn's estimating procedure.

The first stage in defining a standardised acreage of cocoa is to note the age classification of cocoa areas surveyed.

> "The cocoa acreage surveyed by the Gold Coast Department of Agriculture is recorded in four well defined age groups. For convenience these are known as A, B, C and D. The A-class group contains all the pre-bearing acreage under eight years old. The B-class group covers the next period from initial bearing up to maximum capacity at sixteen years old. The C-class group is wider and embraces all the next fifteen fully bearing years. The last group, D-class, takes in all cocoa from the time peak bearing capacity is passed until the trees start to die."
> [Tanburn (1955: 8)]

Surveyed and estimated cocoa acreage by region and by age class is shown in tables 3.6(a) and 3.7(a).

The second stage is to derive what Tanburn terms an <u>optimum equivalent acreage</u>, which consists in standardising for age by setting the C-class equal to 1.0 and making other age classes equivalent. This is done by giving the age classes the following weights: A weight 0, B weight 0.46 and D weight 0.78. The results of creating the optimum equivalent acreage, so defined, are shown in table 3.6(b) for surveyed acreage and table 3.7(b) for estimated acreage.

Table 3.6 Surveyed Acreage, Output, Productivity 1955

3.6(a)

Thousand acres

| | Ashanti | Brong Ahafo | Eastern | Central | Western | Volta | Total |
|---|---|---|---|---|---|---|---|
| Condition factor | 0.765 | 0.818 | 0.707 | 0.735 | 0.766 | 0.789 | |
| A(1948-1955) (0) | 264.9 | 318.3 | 57.3 | 49.8 | 29.9 | 59.8 | 780.1 |
| B(1940-1948)(0.46) | 191.1 | 91.6 | 60.5 | 28.5 | 11.1 | 35.9 | 418.8 |
| C(1925-1940)(1.0) | 621.5 | 299.3 | 182.5 | 156.6 | 46.8 | 152.9 | 1459.6 |
| D(Before 1925) (0.78) | 433.3 | 62.7 | 192.4 | 144.3 | 18.7 | 30.8 | 882.2 |
| Total | 1510.8 | 771.9 | 492.8 | 379.2 | 106.5 | 279.5 | 3540.6 |

3.6(b)

Thousand Optimum Equivalent Acreage

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B | 87.9 | 42.1 | 27.8 | 13.1 | 5.1 | 16.5 | 192.5 |
| C | 621.5 | 299.3 | 182.5 | 156.6 | 46.8 | 152.9 | 1459.6 |
| D | 337.9 | 48.9 | 150.1 | 112.6 | 14.6 | 24.0 | 688.1 |
| Total | 1047.3 | 390.3 | 360.4 | 282.3 | 66.5 | 193.4 | 2340.2 |

3.6(c)

Standardised Productivity Measure

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Equivalent Production (in acres) | 801.2 | 319.3 | 254.8 | 207.5 | 50.9 | 152.6 | 1786.3 |
| Output (in tons) | 69.1 | 43.0 | 40.8 | 34.0 | 10.9 | 22.0 | 219.8 |
| Productivity (in lbs/acre) | 193.2 | 301.7 | 358.7 | 367.0 | 479.7 | 322.9 | 275.6 |

Source: Tanburn (1955) reorganised (see footnote 3).

Table 3.7 Estimated Acreage, Output, Productivity 1955

3.7(a)

Thousand acres

| | Ashanti | Brong Ahafo | Eastern | Central | Western | Volta | Total |
|---|---|---|---|---|---|---|---|
| Condition factor | 0.765 | 0.818 | 0.707 | 0.735 | 0.766 | 0.789 | |
| A(1948-1955) (0) | 283.2 | 518.4 | 58.1 | 77.3 | 123.7 | 70.7 | 1131.3 |
| B(1940-1948)(0.46) | 204.3 | 149.2 | 61.3 | 44.2 | 45.8 | 42.4 | 547.3 |
| C(1925-1940)(1.0) | 664.5 | 487.5 | 185.0 | 242.9 | 193.3 | 180.5 | 1953.6 |
| D(Before 1925) (0.78) | 463.2 | 102.1 | 195.0 | 223.8 | 77.2 | 36.4 | 1097.7 |
| Total | 1615.3 | 1257.2 | 499.4 | 588.2 | 440.0 | 330.0 | 4730.0 |

3.7(b)

Thousand Optimum Equivalent Acreage

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B | 94.0 | 68.6 | 28.2 | 20.3 | 21.1 | 19.5 | 251.8 |
| C | 664.5 | 487.5 | 185.0 | 242.9 | 193.3 | 180.5 | 1953.6 |
| D | 361.3 | 79.6 | 152.1 | 174.6 | 60.2 | 28.4 | 856.2 |
| Total | 1119.8 | 635.8 | 365.3 | 437.8 | 274.5 | 228.4 | 3061.6 |

3.7(c)

Standardised Productivity Measure

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Equivalent Production (in acres) | 856.6 | 520.1 | 258.3 | 321.8 | 210.3 | 180.2 | 2347.3 |
| Output (in tons) | 69.1 | 43.0 | 40.8 | 34.0 | 10.9 | 22.0 | 219.8 |
| Productivity (in lbs/acre) | 180.7 | 185.2 | 353.8 | 236.7 | 116.1 | 273.5 | 209.8 |

Source: Tanburn (1955) reorganised (see footnote 3).

The third stage is to make an allowance, in addition to age, for the condition of the cocoa. Qualitative data is obtainable from the Tanburn data as the condition of the cocoa was recorded as good, fair, poor or dying. As Tanburn notes, "some arbitrary method of converting these classifications to a numerical base is necessary for the calculation of a combined condition-factor and it has been assumed that fair condition of cocoa will produce two-thirds, and poor condition one third of good condition cocoa; and that no yield will be obtained from dying acreage". [Tanburn (1955: 9)]

We have used these weights to derive an average condition factor for each region. These are shown below each region in tables 3.6(a) and 3.7(a). By multiplying the optimum equivalent acreage by this condition factor we can derive what Tanburn terms an <u>equivalent production</u> acreage. <u>This is what we mean by standardised acreage, i.e. an acre of cocoa in 'good' condition aged between 16 and 30 years</u>. Tables 3.6(c) and 3.7(c) show this measure of standardised acreage for each region for surveyed area and estimated area. In these tables we also show annual output for each region for 1955 which enables us finally to derive an average and a regional disaggregation of cocoa productivity measured in lbs/acre. This is the final line in tables 3.6(c) and 3.7(c).

This regional disaggregation of land productivity is, we would argue, strong grounds for viewing Tanburn's estimated acreage as a better measure of total acreage than the surveyed area. If the survey data were accepted, it would imply that productivity in the Brong Ahafo region were 50 per cent higher than in Ashanti and that productivity in the Western region was nearly three times as high. As the cocoa soils to the West are inferior to those in the East, these productivity levels relative to the average are not credible. Note that deriving a regional disaggregation was vital for drawing this conclusion as both aggregate productivities 288.5 lbs/acre for surveyed acreage and 219.6 lbs/acre for estimated acreage are consistent with the broader, less detailed calculations which, to our knowledge, have always previously been used.

We are now in a position to compare average productivity in the 1950s with that in the 1970s. A study identical in conception and formulation to the survey of 1949-55 was begun in 1970 and its provisional results reported in Cocoa Production Division (1978). For this study the problem of a divergence between surveyed and estimated area does not arise.(4) However, a problem common to both studies, namely the length of the period over which the survey was conducted, will be considered below.

Table 3.8 presents the results for the 1975 survey in an identical manner to those for table 3.7. Total acreage is very similar, 4.7 million acres in 1955 and 5.0 million acres in 1975. However, the age composition of the acreage is very different in the two years. In 1955 table 3.7 shows that nearly one quarter of the acreage was between 0 and 8 years and thus bearing no cocoa, whereas by 1975 this proportion had fallen to less than 10 per cent. These different age structures are consistent with numerous observations of the Ghana cocoa industry that acreage was being rapidly expanded in the period after 1947, whereas little new planting was occurring in the 1970s.

Table 3.8 Acreage, Output, Productivity 1975

3.8(a) Thousand acres

| | Ashanti | Brong Ahafo | Eastern | Central | Western | Volta | Total |
|---|---|---|---|---|---|---|---|
| Condition Factor | 0.82 | 0.86 | 0.78 | 0.84 | 0.85 | 0.89 | |
| A(1975-1967)(0-7) | 71.1 | 75.5 | 61.4 | 43.8 | 200.1 | 6.0 | 457.9 |
| B(1959-1967)(8-15) | 190.2 | 156.4 | 158.8 | 81.5 | 243.7 | 15.0 | 845.6 |
| C(1945-1959) (16-30) | 812.4 | 579.3 | 691.5 | 280.1 | 309.7 | 209.6 | 2882.5 |
| D(Over 30) | 263.6 | 91.2 | 175.4 | 125.0 | 81.0 | 83.6 | 819.8 |
| Total | 1337.3 | 902.5 | 1087.1 | 530.3 | 834.5 | 314.2 | 5005.8 |

3.8(b) Thousand Optimum Equivalent Acreage

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B | 87.5 | 72.0 | 73.1 | 37.5 | 112.1 | 6.9 | 389.0 |
| C | 812.4 | 579.3 | 691.5 | 280.1 | 309.7 | 209.6 | 2882.5 |
| D | 205.6 | 71.1 | 136.8 | 97.5 | 63.2 | 65.2 | 639.5 |
| Total | 1105.5 | 722.4 | 901.3 | 415.0 | 485.0 | 281.7 | 3911.0 |

3.8(c) Standardised Productivity Measure

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Equivalent Production (in acres) | 908.4 | 618.2 | 702.5 | 349.1 | 411.0 | 249.4 | 3236.7 |
| Output (in tons) | 110.7 | 79.9 | 64.2 | 54.8 | 46.4 | 13.5 | 369.5 |
| Productivity (in lbs/acre) | 273.0 | 289.5 | 204.7 | 351.6 | 252.9 | 121.3 | 255.7 |

Source: Cocoa Production Division (1978).

Table 3.9 Stylised Profile of Cocoa Acreage, Bearing and Non-Bearing Ghana 1925-1947

Thousand acres

| | Total Acreage | New Plantings | Exits | Net New Plantings | Non-Bearing Acreage | Bearing Acreage | Output '000 tons | Output/acre lbs |
|---|---|---|---|---|---|---|---|---|
| 1925 | 2000 | 120 | 15 | 105 | 800 | 1200 | 218.2 | 407.3 |
| 1926 | 2105 | 120 | 15 | 105 | 840 | 1265 | 230.9 | 408.9 |
| 1927 | 2210 | 120 | 15 | 105 | 880 | 1330 | 209.9 | 353.5 |
| 1928 | 2315 | 120 | 15 | 105 | 920 | 1395 | 225.1 | 361.5 |
| 1929 | 2420 | 120 | 15 | 105 | 960 | 1460 | 238.1 | 365.3 |
| 1930 | 2525 | 120 | 15 | 105 | 1000 | 1525 | 190.6 | 280.0 |
| 1931 | 2630 | 120 | 15 | 105 | 1040 | 1590 | 244.1 | 343.9 |
| 1932 | 2735 | 120 | 15 | 105 | 1080 | 1655 | 233.8 | 316.4 |
| 1933 | 2840 | 120 | 15 | 105 | 1120 | 1720 | 255.7 | 330.0 |
| 1934 | 2945 | 120 | 15 | 105 | 1160 | 1785 | 220.0 | 276.1 |
| 1935 | 3050 | 120 | 15 | 105 | 1160 | 1890 | 277.2 | 328.5 |
| 1936 | 3155 | 120 | 15 | 105 | 1160 | 1995 | 285.0 | 320.0 |
| 1937 | 3260 | 120 | 15 | 105 | 1160 | 2100 | 300.0 | 320.0 |
| 1938 | 3365 | 120 | 15 | 105 | 1160 | 2205 | 232.0 | 235.7 |
| 1939 | 3470 | 120 | 15 | 105 | 1160 | 2310 | 298.0 | 289.0 |
| 1940 | 3575 | 120 | 15 | 105 | 1160 | 2415 | 241.7 | 224.2 |
| 1941 | 3700 | 0 | 15 | -15 | 1180 | 2520 | 237.0 | 210.7 |
| 1942 | 3685 | 0 | 15 | -15 | 1060 | 2625 | 250.7 | 213.9 |
| 1943 | 3670 | 0 | 15 | -15 | 940 | 2730 | 207.3 | 170.1 |
| 1944 | 3655 | 0 | 15 | -15 | 820 | 2835 | 196.1 | 154.9 |
| 1945 | 3640 | 0 | 15 | -15 | 700 | 2940 | 228.7 | 174.2 |
| 1946 | 3625 | 0 | 15 | -15 | 580 | 3045 | 209.4 | 154.0 |
| 1947 | 3610 | 190 | 50 | 140 | 460 | 3150 | 192.1 | 136.6 |

From tables 3.7 and 3.8 we not only have measures of cocoa acreage in 1955 and 1975, we also have measures of planting rates and from table 3.7 a <u>minimum</u> measure of cocoa acreage in 1925. We now use the evidence of tables 3.7 and 3.8 to construct a stylised profile of cocoa acreage over the period since 1925. Such a stylised profile for the period 1925 to 1947 is presented in table 3.9.

From table 3.7(a) we have a measure of cocoa acreage of 1.1 million acres at 1925. Now this figure excludes that part of the Eastern Region which had by 1955 been devastated by swollen shoot, an area of approximately 400,000 acres.(5) Adding this to the 1.1 million acres gives a minimum figure for 1925 of 1.5 million acres. Again from table 3.7(a) we have a measure of the planting rate between 1925 and 1940, approximately 100,000 acres a year on average. To infer net new plantings it is necessary to make an assumption about exits from the industry, about which no direct information is available. However, the most important cause of exits from the industry was certainly the gradual spread of swollen shoot virus, first identified in the early 1920s. If we assume this disease caused from 1925 onwards a total loss of 400,000 acres by 1955, we can assume exits of 15,000 acres per year. Now assuming over the period 1925 to 1941 average net new planting of 85,000 acres per year (100,000 planting - 15,000 exits) would give for 1941 a total acreage of 2.9 million acres. This number is clearly too low as certainly no net new planting occurred between 1941 and 1947 and it is impossible that acreage could have expanded by at least 1.8 million acres in seven years. Two explanations are possible; one is that 100,000 acres a year is too low as an estimate of the planting rate between 1925 and 1940. The second possible explanation is that 1.5 million is too low an estimate for the 1925 acreage.

We argue below that net new planting between 1947 and 1955 was of the order of 140,000 acres a year, which would imply a figure for 1947 of 3.61 million acres. Assuming no new planting between 1941 and 1947 would imply an acreage total of 3.7 million acres for 1941. We assume that both our explanations for the underestimate of acreage apply and increase our acreage estimate for 1925 by approximately 25 per cent and the new plantings rate by 20 per cent, giving the full profile for net new planting shown in table 3.9. Note that even this resulting figure for 1925 of approximately 2.0 million acres gives a lower planting rate between 1900 and 1925 than that assumed for the period after 1925.

Table 3.9 also shows implied average productivity of bearing acreage. We assume following Beckett (1972) that with peasant techniques yields would occur 10 years after planting. Assuming a constant rate of planting between 1900 and 1925 would give 1.2 million bearing acres in 1925. Bearing acreage is then new planting at ten years ago minus exits in the current period. Table 3.9 shows the resulting profile of bearing acreage. There was over the whole period a gradual decline in the productivity of bearing acreage from 379.3 lbs/acre in the five years 1925/29 to a low of 167 lbs/acre by 1944/48. It is apparent from chart 3.2, page 92, where a complete series for productivity is shown, that this falling level of productivity is implied by the data showing no sustained rise in output from 1925 to 1941 with rising acreage under cocoa.

Table 3.10 Yield of Random Planted Amelonado Cocoa - Old Station W.A.C.R.I., Tafo, 1938-9 to 1959-60

| Year (1 April-31 March) | Losses in Tree Population Number | Losses in Tree Population % | Average yield in lbs dry cocoa/acre | Estimated yield in lbs dry cocoa assuming no tree losses | Estimated loss in lbs dry cocoa per acre due to tree losses |
|---|---|---|---|---|---|
| 1938/39 | - | - | 922 | 922 | - |
| 1939/40 | 27 | 0.1 | 798 | 799 | 1 |
| 1940/41 | 428 | 1.6 | 827 | 837 | 10 |
| 1941/42 | 643 | 2.4 | 897 | 942 | 45 |
| 1942/43 | 946 | 3.6 | 781 | 851 | 70 |
| 1943/44 | 380 | 1.6 | 845 | 930 | 85 |
| 1944/45 | 537 | 2.3 | 803 | 921 | 118 |
| 1945/46 | 709 | 2.9 | 738 | 873 | 135 |
| 1946/47 | 810 | 3.4 | 511 | 621 | 110 |
| 1947/48 | 705 | 3.0 | 488 | 603 | 115 |
| 1948/49 | 761 | 3.4 | 662 | 837 | 137 |
| 1949/50 | 465 | 2.1 | 614 | 798 | 184 |
| 1950/51 | 582 | 2.7 | 613 | 807 | 194 |
| 1951/52 | 552 | 2.7 | 651 | 891 | 240 |
| 1952/53 | 452 | 2.3 | 541 | 761 | 220 |
| 1953/54 | 504 | 2.6 | 567 | 794 | 230 |
| 1954/55 | 600 | 3.1 | 439 | 646 | 207 |
| 1955/56 | 454 | 2.5 | 464 | 712 | 248 |
| 1956/57 | 602 | 3.3 | 597 | 943 | 346 |
| 1957/58 | 529 | 3.0 | 532 | 869 | 337 |
| 1958/59 | 484 | 2.9 | 625 | 1069 | 444 |
| 1959/60 | 442 | 2.4 | 515 | 916 | 401 |
| Total | 11,612 | 42.1 | 14,430 | 18,345 | 3,915 |
| Mean | | | 656 | 834 | 178 |

Source: Hall and Smith (1963).

It is of interest whether and how far this decline in productivity can be ascribed to the swollen shoot virus. We have allowed for the devastated area in our figure for exits from the industry. However, the effects of the virus would have led to a decline in the productivity of bearing acreage as is shown in table 3.10 reproduced from Hall and Smith (1963). Between 1938 and 1947 productivity approximately halved, whereas the corresponding overall decline in aggregate productivity was 40 per cent. As swollen shoot was concentrated in its effects in the Eastern Region, this cannot be the full explanation. We show in chapter 4 that by the 1940s cocoa prices in real terms had reached levels which were very low. This may well have led to abandonment of areas under cocoa so that what we term bearing acreage overstates the area actually being farmed.

We now wish to use the evidence of table 3.8 to extend our stylised profile of cocoa acreage from 1947 to 1975 and justify our argument that acreage in 1947 was about 3.6 million acres. From 1947 onwards we have an additional cause of exits from the industry, namely the official attempts to control swollen shoot by cutting out. It is possible to measure the progress of this campaign as the number of trees cut out was recorded and is shown in table 3.11. Between 1949 and 1955, 39.5 million trees were cut out, of which the vast majority were from the Eastern Region. Assuming 200 trees/acre, such a number implies an exit of some 200,000 acres, i.e. about 30,000 acres a year, to which we must add 15,000 acres/year of exits from the devastated area. We assume a total of exits of 50,000 acres/ year for simplicity.

Table 3.11 Swollen Shoot Control - Total Number of Diseased Trees Cut Out on Initial Treatment and Retreatment

Number of Trees

| Crop Year | Total Initial & Resurvey | Ashanti | Brong Ahafo | Eastern | Central | Western | Volta |
|---|---|---|---|---|---|---|---|
| 1945/46 | 631,422 | 100,666 | - | 522,949 | - | - | 7,807 |
| 1946/47 | 1,472,912 | 193,404 | - | 1,269,690 | - | - | 9,818 |
| 1947/48 | 1,949,477 | 124,017 | - | 1,820,263 | - | - | 5,198 |
| 1948/49 | 2,668,324 | 95,029 | - | 2,516,284 | - | 50,837 | 6,174 |
| 1949/50 | 3,377,605 | 195,841 | - | 3,010,832 | - | 156,113 | 14,820 |
| 1950/51 | 2,554,645 | 152,699 | - | 2,224,076 | - | 165,448 | 12,423 |
| 1951/52 | 3,493,721 | 93,140 | - | 3,211,646 | - | 183,528 | 5,407 |
| 1952/53 | 6,703,294 | 88,941 | - | 6,212,416 | - | 391,127 | 10,811 |
| 1953/54 | 9,473,741 | 59,146 | - | 8,576,270 | - | 826,107 | 12,218 |
| 1954/55 | 11,241,178 | 84,378 | - | 10,336,270 | - | 809,427 | 11,103 |
| 1955/56 | 11,303,412 | 101,624 | - | 10,523,048 | - | 669,767 | 8,974 |
| 1956/57 | 10,315,505 | 78,517 | - | 9,389,042 | - | 841,640 | 6,307 |
| 1957/58 | 11,679,175 | 63,382 | - | 10,828,957 | - | 781,960 | 4,876 |
| 1958/59 | 13,032,397 | 60,008 | - | 12,469,072 | - | 498,953 | 4,364 |
| 1959/60 | 10,989,086 | 58,637 | - | 10,574,553 | - | 350,268 | 5,628 |
| 1960/61 | 8,169,035 | 57,405 | 583 | 7,782,163 | 19,367 | 304,332 | 5,186 |
| 1961/62 | 4,176,084 | 37,172 | 797 | 3,993,487 | 23,591 | 119,108 | 1,930 |
| 1962/63 | 958,433 | 16,004 | 665 | 901,503 | 7,826 | 31,829 | 607 |
| 1963/64 | 183,987 | 10,966 | 353 | 146,038 | 4,648 | 20,765 | 1,217 |
| 1964/65 | 3,853,239 | 159,623 | 228 | 3,471,142 | 34,721 | 178,751 | 8,774 |
| 1965/66 | 3,990,543 | 123,386 | 107 | 3,686,799 | 34,693 | 138,390 | 7,168 |
| 1966/67 | 5,645,708 | 184,890 | 195 | 5,315,318 | 45,158 | 93,289 | 6,858 |
| 1967/68 | 5,120,131 | 139,725 | 228 | 4,829,861 | 53,243 | 92,602 | 4,472 |
| 1968/69 | 3,191,072 | 136,225 | 321 | 2,906,841 | 37,144 | 107,202 | 3,339 |
| 1969/70 | 757,232 | 159,910 | 1,159 | 444,368 | 48,320 | 101,392 | 2,083 |
| 1970/71 | 2,988,676 | 348,714 | 217 | 2,570,611 | 31,683 | 35,774 | 1,677 |
| 1971/72 | 3,120,972 | 450,114 | 6,651 | 2,454,189 | 18,741 | 174,364 | 16,913 |
| 1972/73 | 3,304,237 | 479,455 | 1,581 | 2,443,218 | 136,904 | 230,950 | 12,129 |
| 1973/74 | 3,180,942 | 194,033 | 2,729 | 2,535,160 | 109,172 | 330,222 | 9,626 |
| 1974/75 | 6,402,220 | 239,482 | 11,656 | 5,374,743 | 364,072 | 367,631 | 44,636 |
| 1975/76 | 7,032,020 | 242,788 | 3,781 | 5,944,801 | 442,874 | 391,448 | 6,328 |

Sources: 1945/46 - 1959/60: Cocoa Industry Division (1960-61)
1960/61 - 1963/64: Cocoa Division, Annual Report (1963-64)
1964/65 - 1975/76: Cocoa Division, Quarterly Progress Reports, various issues.

We need next to establish the planting rate between 1947 and 1955. Table 3.7(a) indicates that 1.1 million acres were planted between 1948 and 1955, which gives a planting rate of approximately 140,000 acres/year. There is, however, evidence from table 3.8(a) that this figure is an underestimate. Table 3.8(a) shows that between 1959 and 1967, 2.9 million acres were planted, giving a planting rate of 190,000 acres/year. It is extremely improbable that the planting rate accelerated after 1955. Assuming 190,000 acres/year planting rate from 1947 gives net new plantings of 140,000 acres/year.

Table 3.12 presents the full profile from 1947 to 1975. So far we have argued that the net planting rate between 1947 and 1955 was 140,000 acres/year. We assume this net rate continues until 1960. The figures for acreage planted between 1959 and 1967, table 3.7(a), suggest a marked slowdown in the rate of planting to about 100,000 acres/year, and a further slowdown between 1967 and 1975 to a rate of 60,000 acres a year.

Again to derive bearing acreage from planting data it is necessary to make assumptions about exits from the industry. This is particularly difficult as very little direct evidence is available. The progress of the swollen shoot control campaign as measured by the number of trees cut out, table 3.11, suggests an acceleration in the rate of cutting out to a peak in 1959. Between 1956 and 1962, 69.7 million trees were cut out, a 75 per cent increase on the earlier six year period. Although we cannot be certain of the profile of exits between 1955 and 1975, it is strongly suggested by the survey data for 1975 that at some stage, probably in the mid 1960s, exits rose so that net new planting was negative, which gives a bearing acreage for 1975 of 4,550 million acres. Our profile suggests that a rise in exits from the latter 1960s roughly cancelled out the new plantings of the mid and early 1960s.

Table 3.12 Stylised Profile of Cocoa Acreage, Bearing and Non-Bearing Ghana 1947-1975

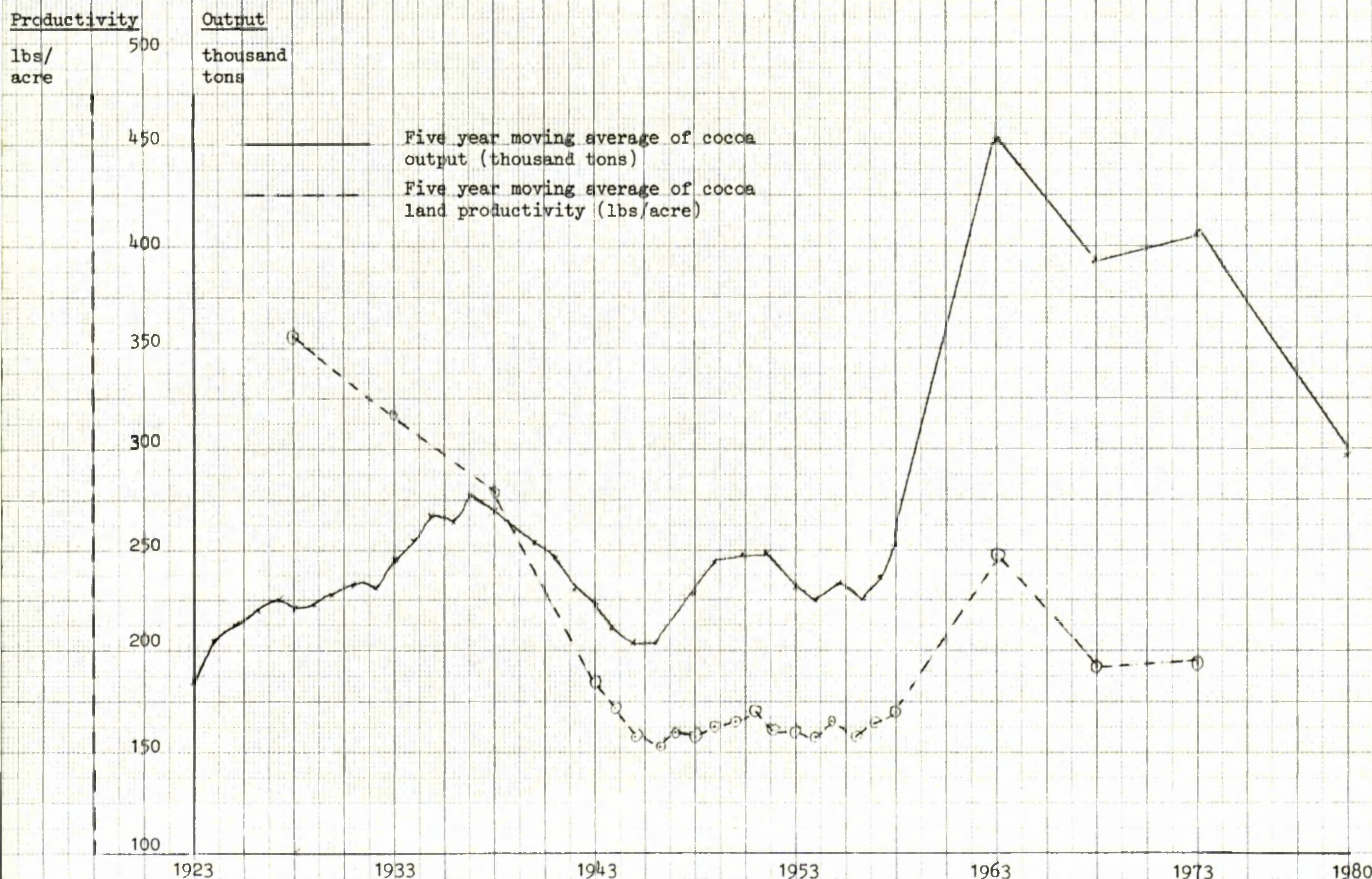
Thousand acres

| | Total Acreage | New Plantings | Exits | Net New Plantings | Non-Bearing Acreage | Bearing Acreage | Output '000 tons | Output/ acre lbs |
|---|---|---|---|---|---|---|---|---|
| 1947 | 3610 | 190 | 50 | 140 | 460 | 3150 | 192.1 | 136.6 |
| 1948 | 3750 | 190 | 50 | 140 | 530 | 3220 | 207.6 | 144.4 |
| 1949 | 3890 | 190 | 50 | 140 | 600 | 3290 | 278.4 | 189.5 |
| 1950 | 4030 | 190 | 50 | 140 | 670 | 3360 | 247.8 | 165.2 |
| 1951 | 4170 | 190 | 50 | 140 | 860 | 3310 | 262.2 | 177.4 |
| 1952 | 4310 | 190 | 50 | 140 | 1050 | 3260 | 210.7 | 144.8 |
| 1953 | 4450 | 190 | 50 | 140 | 1240 | 3210 | 247.0 | 172.4 |
| 1954 | 4590 | 190 | 50 | 140 | 1430 | 3160 | 207.7 | 147.2 |
| 1955 | 4730 | 190 | 50 | 140 | 1620 | 3110 | 219.8 | 158.3 |
| 1956 | 4870 | 190 | 50 | 140 | 1810 | 3060 | 228.8 | 167.5 |
| 1957 | 5010 | 190 | 50 | 140 | 1810 | 3200 | 255.7 | 179.0 |
| 1958 | 5150 | 190 | 50 | 140 | 1810 | 3340 | 206.5 | 138.5 |
| 1959 | 5290 | 190 | 50 | 140 | 1810 | 3480 | 255.5 | 164.5 |
| 1960 | 5430 | 190 | 50 | 140 | 1810 | 3620 | 317.1 | 196.2 |
| 1961 | 5570 | 100 | 50 | 50 | 1810 | 3760 | 432.2 | 257.5 |
| 1962 | 5620 | 100 | 50 | 50 | 1720 | 3900 | 408.6 | 234.7 |
| 1963 | 5670 | 100 | 50 | 50 | 1630 | 4040 | 421.3 | 233.6 |
| 1964 | 5720 | 100 | 50 | 50 | 1540 | 4180 | 421.0 | 225.6 |
| 1965 | 5770 | 100 | 50 | 50 | 1450 | 4320 | 571.7 | 296.4 |
| 1966 | 5820 | 10 | 100 | -90 | 1410 | 4410 | 409.2 | 207.8 |
| 1967 | 5730 | 10 | 100 | -90 | 1230 | 4500 | 375.3 | 186.8 |
| 1968 | 5640 | 10 | 100 | -90 | 1050 | 4590 | 415.0 | 202.5 |
| 1969 | 5550 | 10 | 100 | -90 | 870 | 4680 | 333.6 | 159.7 |
| 1970 | 5460 | 10 | 100 | -90 | 690 | 4770 | 411.0 | 193.0 |
| 1971 | 5370 | 10 | 100 | -90 | 600 | 4770 | 421.0 | 197.7 |
| 1972 | 5280 | 10 | 100 | -90 | 510 | 4770 | 457.3 | 214.7 |
| 1973 | 5190 | 10 | 100 | -90 | 420 | 4770 | 415.2 | 195.0 |
| 1974 | 5100 | 10 | 100 | -90 | 330 | 4770 | 365.9 | 171.8 |
| 1975 | 5000 | 10 | 100 | -90 | 230 | 4770 | 369.5 | 173.5 |

We turn finally to consider other estimates of the area of land under cocoa that have been made. FAO (1955) gives for the Gold Coast and British Togoland an acreage under cocoa in 1934-38 of 409,000 hectares (= 1,010,656 acres). This figure is probably based on Department of Agriculture estimates and is an inference from productivity obtained by the Department. It is on the basis of our figures approximately one third of the correct number.

Killick (1966) quotes a Department of Agriculture estimate for March 1964 of 4.2 million acres which "estimates include areas under cocoa not yet bearing but, of course, exclude those parts of the Eastern region where cocoa farming has been abandoned because of disease" (238). Later an acreage of 3.2 million acres for 1958-60 is given. These numbers are 30 per cent lower than ours. Table 3.5 gave a figure for 1970 of 3.6 million acres which we believe too to be a substantial underestimate. As cocoa acreage was certainly if anything declining in the 1970s, the number is clearly incompatible with the survey evidence.

Our conclusion is that both the enterprise of the Ghanaian peasant in expanding cocoa acreage has been grossly underestimated, and that his technical efficiency in doing so has been therefore overestimated. There are (or have been) far larger areas under cocoa of far lower average productivity than has previously been recognised. Chart 3.2 shows the figures graphically. If our calculations err it is in over-estimating cocoa acreage in the early part of the century; thus our estimate for the decline in productivity is a minimum one. The reasons for the decline are clear from our discussion. Swollen shoot where it was prevalent was a major cause. At periods of low prices much 'bearing' cocoa land may have been abandoned and finally the spread of cocoa into new areas almost certainly meant an extension to areas of lower productivity.




(Years are mid points of 5-year moving average) (The numbers on which this chart are based are in the Appendix)

Sources: Appendix Table 1, Tables 3.9 and 3.12.

### 3.3.2 Labour Inputs and Labour Productivity

Labour inputs into the cocoa industry are the result of increases in labour hours per labourer, increases in population and permanent and seasonal migration. For the establishment of the cocoa industry in the period 1891-1911 Szereszewski (1965: 76-77) argued that increases in labour hour per labourer must have been an important source of additional labour input. This conclusion has been challenged by Ingham (1981) whose data contain, however, very serious errors.(6) Hill (1963: 17) asserts that "at a lat er stage, when the cocoa trees had started to bear, many (though not all) of the larger farmers began to employ farm labourers who were rewarded with a share of the crop they harvested and who also assisted in the establishment of new farms. By 1910, or earlier, there may have been as many farm labourers as farmers, most of them being Ewe and others from east of the Volta". Thus labour, some at least of it migrant, was necessary for the seasonal peak from quite an early stage. Hill (1963) argues that permanent migration was important in the initial establishment of the industry. Ingham regards migrant labour as being inconsistent with the vent-for-surplus model. However, we have defined the model to mean surplus labour hours (section 2.3). Where the labour comes from is of no importance, whether it is 'surplus' is of central importance. For the period from the 1930s we have evidence on north-south seasonal migration from Beals and Menezes (1970).

Beals and Menezes are primarily concerned to argue the efficiency of the migrationary pattern in Ghana. However, they also provide valuable data on interregional migration.

> "The principal economic relationship between North and South has been the considerable seasonal migration between the two regions. Northerners migrate to find jobs in the South. Some settle permanently in the South. Most, however, work in the South on a seasonal basis and return home for the single growing season there.

> Interregional labour migration has been occurring in Ghana since 1900, but the period of remarkable development of the migrant labour system was 1945-54. During 1937-40, for example, an average of 35,000 labourers migrated from the North to the South each year and in 1945 the number of seasonal labour migrants appeared to be about 46,000. Then, seasonal migration doubled between 1945 and 1948 and increased fivefold to more than 200,000 by 1954. After 1954 the volume of migration grew more slowly."
> [Beals and Menezes (1970: 111)]

Beals and Menezes argue that data from the population census indicate that only a small percentage of this migration was permanent. The census is our final source of direct information about labour inputs into cocoa. The evidence from the 1960 census has been analysed by Killick (1966). Table 3.13 is reproduced from Killick (1966). The total number of cocoa farmers in table 3.13 is very similar to the number of holders recorded in the 1970 census, table 3.5. Killick notes that the population census will have underestimated the number of labourers and other employees working on the farms due to the seasonality of labour demands.

As Beals and Menezes note, the seasonal pattern of migration depends on the distribution of farm composition between bearing and non-bearing farms. The most detailed micro study for Ghana is that of Okali (1975) and table 3.14 reproduces the results for the monthly distribution of labour hours on cocoa farms at Dominase. We have argued in section 3.2.2 that Okali's numbers are too high by about 25 per cent. For establishing cocoa farms peak labour demands are between March and June. Okali gives a figure of 107 hours/acre/month, which we reduce by 25 per cent to give 80 hours/acre/month. Assuming a 7-hour day that gives 11 days/acre/month. If we accept a figure for 1955 of 1.1 million acres of farms being established this implies that 12.1 million man days/month are required.

Assuming a 20-day month implies that at the seasonal peak for establishing a farm some 600,000 labourers are required. This, very broadly, is consistent with the estimates of the population census and the migration estimates of Beals and Menezes.

Table 3.13 Categories of Cocoa Labour 1960

| Type of Labour | Male | Female | Total |
|---|---|---|---|
| Cocoa Farmers | 235,280 | 77,230 | 312,510 |
| Caretakers | 47,410 | 2,670 | 50,080 |
| Family Workers | 26,850 | 63,990 | 90,840 |
| Labourers and other Employees | 64,460 | 4,460 | 68,920 |
| Total | 374,000 | 148,350 | 522,350 |

Source: Killick (1966: Table 10.2), original source 1960 Census of Population Advance Report.

Table 3.14 Monthly Distribution of Labour Hours on Cocoa Farms at Dominase

Hours per Acre Unweighted

| | Year One | 13 Months to Maturity | Establishment | Bearing Farms | All Farms |
|---|---|---|---|---|---|
| December | 0.7 | 26.0 | 26.7 | 14.2 | 40.9 |
| January | 36.4 | 18.1 | 54.5 | 11.4 | 65.9 |
| February | 74.6 | 4.1 | 78.7 | 3.3 | 82.0 |
| March | 117.2 | 12.6 | 129.8 | 1.8 | 131.6 |
| April | 72.8 | 6.6 | 79.4 | 1.0 | 80.4 |
| May | 84.4 | 5.8 | 90.2 | 3.1 | 93.3 |
| June | 101.4 | 28.3 | 129.7 | 15.9 | 145.6 |
| July | 72.8 | 34.4 | 107.2 | 18.2 | 125.4 |
| August | 79.1 | 21.2 | 100.3 | 11.6 | 111.9 |
| September | 48.7 | 27.4 | 76.1 | 12.7 | 88.8 |
| October | 18.2 | 10.8 | 29.0 | 17.4 | 46.4 |
| November | 14.5 | 24.1 | 38.6 | 18.0 | 56.6 |
| Total | 720.8 | 219.4 | 939.9 | 128.6 | 1068.8 |

Source: Okali (1975: Table 4.10).

As we have no time series data on labour inputs, in order to infer a measure of labour productivity it is necessary to formulate the production function for cocoa. We have two estimated micro production functions for samples of cocoa farms, that in Okali (1975) and Galletti, Baldwin, Dina (1956). These two studies carried out nearly twenty years apart and for different countries produced remarkably similar results. The Nigerian study concluded that "the basic equation relating hours, acreage and production appears to be very nearly $P^5 = A^3H^2$ where P stands for production in pounds, A for acres and H for hours" (314). The equation used in fitting the data is,

$$P = 53.54\ A^{\cdot 675}\ H^{\cdot 325}$$

For the mean of 220 hours/acre (Table 137: 125) the equation would imply output/acre of 309 lbs and output/man hour of 1.4 lbs.

The Okali (1975) study, using similar notation, derives the equation,

$$P = 41.602\ A^{\cdot 58}\ H^{\cdot 42}$$

Average hours/acre at Dominase were 163.2 (Table 5.2: 69), which would imply output/acre of 353.6 lbs and output/man hour of 2.2 lbs.

To derive an aggregate measure of labour productivity for a standardised acre of bearing cocoa we assume a production function of the form,

$$P = VA^{0\cdot 6}\ H^{0\cdot 4}$$

where, as above, P = Production in lbs

A = Acreage in acres

H = Labour in hours

and V = a constant term.

For 1955 we assume there are 2,347,000 'equivalent production acres' (table 3.7). We assume that on average there are 200 hours/acre/year input (table 3.3 shows an average of 26 man days/acre/year = 182 hours/acre/year excluding Rourke's figures. We increase this to 200 hours/acre as the Nigerian study was more comprehensive). We also assume a 7-hour day and 29 man days/acre. This gives a total of 469.4 million hours (= 67.1 million man days). We now proceed to derive V as a residual as

$$P_{1955} = 219.8 \times 2240 \times 1000 = V_1 (2347,000)^{0\cdot 6} (469,400,000)^{0\cdot 4}$$

$$\therefore V_1 = 25.2$$

giving our measure of the production function for cocoa in 1955 as,

$$P = 25.2\ A^{0\cdot6}\ H^{0\cdot4}$$

For 1975 we assume there are 3,236,700 'equivalent production acres' (table 3.8). We assume that average labour inputs/acre have remained constant over the twenty year period, giving a total input for 1975 of 647.34 million hours. Thus our measure for the production function for aggregate cocoa output in 1975 is,

$$P_{1975} = 369.5 \times 2240 \times 1000 = V_2(3{,}236{,}000)^{0\cdot6}(647{,}340{,}000)^{0\cdot4}$$

$$V_2 = 30.7$$

giving $P = 30.7\ A^{0\cdot6}\ H^{0\cdot4}$

If we can write our general production function for the post war period as,

$$P = 25.2\ .\ e^{t}\ .\ A^{0\cdot6}\ .\ H^{0\cdot4}$$

then the average rate of growth of technical progress was 1 per cent per annum. However, we argue in chapter 6 that productivity rises were (a) not neutral as this specification implies, and (b) concentrated in the period to 1965.

Three major conclusions derive from our analysis. One is that productivity in the post war period has grown but at very modest rates. Secondly, productivity levels since 1947 remain substantially below those achieved earlier in the century; and thirdly, techniques have existed for some time which could substantially raise the level of productivity. These questions on technical progress we return to in chapter 6. We have shown that Myint was optimistic in viewing the growth process as characterised by constant productivity. Over the long run there have been substantial falls in both land and labour productivity.

### 3.4 Cocoa Land and Extensive Growth

The evidence already cited clearly shows that 'surplus' land in the cocoa sector existed in the early part of the century. We now consider whether this cocoa land has been exhausted. We have assumed in table 3.12 that total acreage continued to expand until 1967. The regional decomposition of cocoa land available for 1955 and 1975 confirms that even at this maximum extent surplus cocoa land has remained available.

From tables 3.7 and 3.8 we see that in 1955 the area under cocoa in Ashanti and Brong Ahafo was greater than in 1975. However, between 1955 and 1975 the area under cocoa in the Western Region doubled. Thus if more cocoa land had been desired it must have been available as the land removed from cocoa production in Ashanti and Brong Ahafo could have been added to the newly settled land in the Western Region.

It is widely believed that the productivity of this new cocoa land to the West was lower than the older land of the East, a finding confirmed for the 1955 survey and marginally so for the 1975 survey. The long run decline in cocoa productivity may certainly be partly explained as we have already noted by the movement to new, less productive areas of cocoa land. However, the fact remains that 'surplus' cocoa land remains and that both the cycles of growth we have noted for the Ghana cocoa industry occurred during a period when 'surplus' land was available. We characterise the growth process in Ghana as extensive in the sense that more factor inputs have always been available. Other evidence supports this contention as to the nature of Ghana's growth process. Akwabi-Ameyaw (1974) shows that following the outbreak of swollen shoot disease in the early 1940s, the recovery in output in the Ashanti region which began in the mid 1950s was largely the result of increasing output from new areas within the region. In a survey of Mampong district to the north-east of Kumasi, Boaten (1974) reports that progress on a rehabilitation scheme is slow, due in large part to the preference of farmers for working new farms. A re-survey of Beckett's village, Akokoaso, by Okali and Kotey (1971) also found a preference for farmers to work on new farms. Further evidence is provided by Okali (1975) who, in considering suitable areas for surveying new farms in the early 1970s, notes that "in the eastern region and much of Ashanti there was little evidence of new planting taking place on any scale. In the more recently planted areas, most of which were in the Western and Brong-Ahafo regions, there was little older cocoa" Okali (1975: 7). These regional studies confirm the acreage data already presented. Where expansion was occurring it occurred on new land while previously used cocoa land was being taken out of use. Such an interpretation is also consistent with regional output data presented in La Anyanne (1972) and Bateman (1974) which show output for the later 1960s lower than for 1960 in all regions except Brong-Ahafo and the Western Region.

On the grounds we have examined so far the applicability of the vent-for-surplus growth model to Ghana has been greater than has previously been thought. We now turn to wider issues of growth in Ghana.

# Chapter 4. Growth and Real Income in Ghana, 1891-1975

## 4.1 Growth, Real Income and Development

In chapter 3 we tested two of the major implications of the vent-for-surplus model set out in chapter 2, namely whether for the cocoa sector surplus land was exhausted and the extent of productivity change. We found that, contrary to the scheme put forward by Findlay (1970), surplus land was not exhausted. Ghana throughout its economic history has had cocoa land it could have utilised if it had wished to do so. In carrying out this test we were able to infer the changes over time of both land and labour productivity. These results enable us to measure the real income of the cocoa sector, which we do in section 4.3 below. However, before considering the cocoa sector in detail in section 4.2, we measure the growth of the whole economy. We do this because we wish to see if the vent-for-surplus sector (cocoa) provided a base for a sustained growth of per capita GDP. In this introductory section we consider the problems raised in using GDP as a measure of welfare as a prelude to the policy issues which will be the concern of chapters 5 and 6.

One measure of the size of GDP and the most commonly used is aggregate GDP at constant market prices. However, it has been widely argued that the prices used, and therefore the size of GDP, cannot be specified without implicitly assuming some distribution objective. Sen (1976), (1979) argues that as, in general, the benefit of an increase in income depends on who receives the benefit then real income in a welfare sense cannot be defined independently of distribution. When discussing efficiency and equity it is necessary to distinguish actual from optimal policies. Sen's definition of real income is based on actual policies, while that due to Mirrlees (1969) depends on optimal policy. Mirrlees' definition, which also underlies the project appraisal methodology of Little and Mirrlees (1974), leads to a consideration of potential real income. We present measures of GDP which coincide closely over the period to 1939 with such measures of potential income in section 4.2.(1)

The problems posed by using market prices in an assessment of real income growth are not, however, confined to the problems of equity. The conventional GDP measure is calculated using base year prices. If relative prices change substantially then the base weighted measure of GDP may fail to reflect changing real income in the sense of a changed command over goods and services. In section 2.4 we have already defined a measure which allows for relative price changes. This we term gross domestic income (GDY) in contrast to gross domestic product (GDP). (We recognise that both these aggregate measures fail to incorporate distribution.) Over the period since 1891 for which we have constructed GDP figures the movements of the terms of trade are of considerable importance both for policy and for a welfare measure of real income.

A focus on the level and distribution of consumption (not, it is to be noted, income) as the appropriate objective of economic policy in developing countries has been described by Little (1982) as the 'liberal' definition of development. In contrast, Sen has argued that the utilitarianism which underlies this view is wholly inadequate as a basis for assessing the welfare effects of development. Sen (1980), (1981) considers other possible objectives which may qualify the real income objective, which include the level of absolute poverty, the possibility of famine, life expectancy and literacy.

The level of absolute poverty can be regarded as another aspect of the distribution of income. In this thesis we do not consider these normative questions, although the importance of income distribution objectives in the determination of policy is considered in chapter 5. The possibility of famine can be regarded in part as a market failure related to insurance markets, an issue discussed in chapter 5. Life expectancy and literacy are clearly much conditioned by public policy and success here might lead to qualifications of failure in growth policy. However, on the basis of Sen's (1981) classification Ghana performs relatively poorly in both these areas of policy.(2)

There remains the possibility that none of the above elements of welfare fully reflect the objectives of government policy. Thus the objectives of growth and welfare may be pursued together with such objectives as the acquisition of the symbols of national prestige and the aggrandisement of the public sector. Such policy objectives have been discussed by Rimmer (1969) for West Africa and in a more general context by Johnson (1965) and Bhagwati (1969). Implicitly such analyses seek to infer objectives from policies. The issue to which we turn in chapter 5 is whether the nationalist objectives are consistent with the real income objective, and to which objective policies have been primarily directed.

A necessary preliminary for this discussion is measurement of GDP and GDY; these are the subject of the next section.

## 4.2 Real GDP Growth 1891-1974

The real growth of GDP over a period of nearly a century poses considerable problems of meaning and measurement. However, if substantial growth has occurred over a long period followed by stagnation, then the orders of magnitude obtainable from the data are of value even if over shorter periods considerable doubt must remain over detail. We will seek to show that over the period to 1939 such substantial growth occurred while the period from 1950 has seen no rise in per capita income. Although our primary interest is in testing the hypotheses regarding the vent-for-surplus mechanism of growth set out in chapter 2, the broad facts of Ghana's twentieth century economic history are of interest as an example of a growth process which, while long and substantial, failed to sustain the levels of income achieved. Why that was so is a question we consider in chapters 5 and 6.

To summarise the output of an economy in a single measure when the composition of the output of that economy is changing rapidly is both difficult and necessary. It is difficult obviously because there is an inevitably arbitrary element in adding up the components to obtain a single aggregate measure.(3) It is, however, necessary if quantitative rather than simply qualitative statements are to be made concerning the growth pattern. Such quantitative statements are vital because otherwise certain selective aspects of the economy will be used in the belief that they represent the whole.

To demonstrate this danger we represent what could be termed the 'political economy' view of Ghana's economy. In a chapter entitled 'The creation of Ghana's peripheral capitalist economy' Howard (1978: 59) argues that

> "by 1915, Ghana, with its heavy reliance on cocoa exports, could be classified as a 'monocultural' economy, in the sense that although it exported more than one crop, cocoa determined its overall economic prosperity. The nature of cocoa as a consumer good, which played a relatively unimportant role in the world economic system and had no use at all in industrial production, meant that Ghana was highly dependent on economic swings in the world cocoa market."

The economy had been transformed between 1891 and 1911 and by "1914 the Gold Coast had already acquired the essentials of the economic and social structures which it was to keep up to the present"[Amin (1973: 42)]. The growth of the Gold Coast from 1891-1911 is viewed as comparable to the growth of the Ivory Coast since 1950; however, "the early miracle of the Gold Coast long ago spent itself, and the growth of the economy had already reached its limits on the eve of Ghana's independence"[Amin (1973: 41)]. The reasons for this conclusion are obscure. Amin appears to regard the failure to develop an industrial base as coterminous with a failure to grow. Green (1971) argues that new cocoa land was not available. Carlsson (1981: 25) says that "when cocoa and gold production began to experience stagnation in the early 1960s, the economy found it increasingly difficult to mobilise the resources needed for further expansion". A similar view can be found in Beckman (1981), although no explanation is offered as to why cocoa output could not grow.

This view recognises that policies since 1951 were not successful but concludes that they involved excessive reliance on the foreign sector. Thus Seidman (1978: 286) argues that,

> "In sum, Ghana's 1951-65 experience indicates that a government policy designed to facilitate expansion of existing market forces in an effort to attain economic development is unlikely to lead to higher levels of living for the entire population. Market forces embedded in institutions shaped in the era of colonialism in both internal and external markets, are far from being effectively competitive as posited by general equilibrium theory. To leave future economic development essentially to the play of existing market forces, as even contemporary development economists seem repeatedly to suggest, appears likely to constrain it, following brief spurts, to slow growth, possibly even stagnation, within the framework of the relatively inelastic world demand for primary product exports. The resulting economy, one-sidedly dependent on world markets subject to violent price fluctuations, is likely to remain less developed and unstable, contributing to a mounting discontent which, in this era of rising expectations - witness the Ghana case - is likely to foster political instability and violence."

The inference drawn by all these authors is that markets cannot produce growth. Where growth is documented as in the Szereszewski (1965) study, it is described as short lived. Evidence of zero per capita growth between 1951 and 1965 when market forces were not allowed to operate (chapter 5) is adduced as evidence that markets do not work. The dependence on cocoa is implied to prevent growth. Is any of this true? We now examine the quantitative evidence to evaluate these issues as well as testing whether the vent-for-surplus growth process provided a basis for sustained growth. We have calculated Ghana's GDP and GDY in aggregate and on a per capita basis for approximately ten year periods from 1891 onwards.

Our procedure relies on three major sources of information. The first is Szereszewski's (1965) study of Ghana between 1891 and 1911. The second is standard national income account sources which provide data from 1950 onwards. The third is a series of terms of trade indices for Ghana from 1900 onwards which we have calculated. The details of these figures are given in the appendix. All major assumptions made are presented in the text.

Table 4.1 presents an expenditure based GDP series at 1968 prices for 1891-1939. Table 4.2 does the same for the period 1950 to 1974. The only difference in the presentation of the tables is that from 1891 to 1939 we distinguish within total private consumption between domestic consumption and imports, whereas from 1950-1974, again within total private consumption, we distinguish between local food and other. Both tables 4.1 and 4.2 distinguish between cocoa and non-cocoa exports, the importance of this distinction having been stressed in chapters 1 and 2. Exports are revalued using the terms of trade indices presented in table 4.3 so that GDP can be distinguished from GDY.(4) Table 4.3 presents not only the barter but also the income terms of trade, again distinguishing between the cocoa and non-cocoa components.

The sources for table 4.2 are the Economic Survey, Killick (1978) and World Bank (1980) and are relatively straightforward. It is in constructing accounts for 1891 to 1939 that we have had to use a variety of sources. Our procedure for 1891-1911 relies on Szereszewski (1965), who gives a constant (1911) price series for expenditure based GDP for 1891, 1901 and 1911. Szereszewski provides a link between 1911 and 1960 which is the basis for the numerous assertions in the literature that the structure of the economy in 1960 was similar to that of 1911. He estimates that

Table 4.1 Ghana's GDP and GDY at constant (1968) prices 1891-1939

NC millions

| | 1891 | 1901 | 1911 | 1919 | 1929 | 1939 |
|---|---|---|---|---|---|---|
| Private Consumption Total | 122 | 144 | 174 | 202 | 330 | 460 |
| Domestic | 104 | 113 | 125 | 170 | 250 | 362 |
| Imports | 18 | 31 | 49 | 32 | 80 | 98 |
| Public Consumption | 2 | 5 | 7 | 7 | 22 | 18 |
| Gross Capital Formation | 3 | 18 | 39 | 53 | 61 | 67 |
| Exports - Total | 9 | 8 | 41 | 118 | 161 | 205 |
| Cocoa | 0 | 0.7 | 23 | 99 | 135 | 158 |
| Other | 9 | 7.3 | 18 | 19 | 26 | 50 |
| Imports | 10 | 24 | 41 | 27 | 67 | 82 |
| GDP at market prices | 126 | 151 | 220 | 353 | 507 | 668 |
| Revalued Exports - Total | 9 | 8 | 41 | 52 | 94 | 111 |
| Cocoa | (0) | 0.7 | 20 | 41 | 73 | 42 |
| Other | (9) | 7.3 | 21 | 11 | 21 | 69 |
| GDY | 126 | 151 | 220 | 287 | 440 | 574 |
| Population (thousands) | 1,650 | 1,825 | 2,000 | 2,350 | 2,870 | 3,505 |
| GDP/capita (NC) | 76 | 83 | 110 | 150 | 177 | 190 |
| GDY/capita (NC) | 76 | 83 | 110 | 122 | 153 | 164 |
| Domestic Sector Output | 117 | 143 | 179 | 235 | 346 | 460 |
| Foreign Sector Output | 9 | 8 | 41 | 118 | 161 | 208 |

Sources: 1891-1911 Szereszewski (1965).
The population figures from 1911 to 1950 assume a 2 per cent growth rate. The official census figure for 1948 was 4,118,450, Gold Coast (1950).
1911-1939 see text for GDP and GDY figures.

Table 4.2 Ghana's GDP and GDY at constant (1968) prices 1950-1974

NC millions

| | 1950 | 1955 | 1960 | 1965 | 1970 | 1974 |
|---|---|---|---|---|---|---|
| Private Consumption Total | 760 | 908 | 1,131 | 1,175 | 1,466 | 1,742 |
| Food (Local) | 300 | 335 | 372 | 337 | 538 | 692 |
| Other | 460 | 573 | 759 | 838 | 928 | 1,050 |
| Public Consumption | 46 | 118 | 173 | 298 | 260 | 269 |
| Gross Capital Formation | 142 | 184 | 301 | 348 | 277 | 288 |
| Exports - Total | 229 | 219 | 327 | 446 | 398 | 404 |
| Cocoa | 161 | 123 | 181 | 327 | 292 | 299 |
| Other | 68 | 96 | 146 | 119 | 106 | 105 |
| Imports | 185 | 310 | 446 | 551 | 472 | 498 |
| GDP at market prices | 992 | 1,118 | 1,488 | 1,716 | 1,929 | 2,204 |
| Revalued Exports - Total | 190 | 227 | 264 | 242 | 495 | 484 |
| Cocoa | 131 | 145 | 135 | 156 | 397 | 359 |
| Other | 59 | 82 | 129 | 86 | 98 | 125 |
| GDY | 953 | 1,126 | 1,425 | 1,512 | 2,026 | 2,282 |
| Population (thousands) | 4,368 | 5,484 | 6,804 | 7,767 | 8,614 | 9,698 |
| GDP/capita (NC) | 227 | 204 | 219 | 221 | 224 | 227 |
| GDY/capita (NC) | 218 | 205 | 209 | 195 | 235 | 235 |
| Domestic Sector Output | 763 | 899 | 1,161 | 1,270 | 1,531 | 1,800 |
| Foreign Sector Output | 229 | 219 | 327 | 446 | 398 | 404 |

Sources: World Bank (1980); Killick (1978); Ghana, Economic Survey, various issues; Appendix tables 6, 9.

Note: It is difficult to reconcile the export volume figures for the period 1960-1974 from the GDP accounts with the sources used in constructing the volume indices of Appendix table 6. In order to retain the GDP totals we have adjusted up the volume of cocoa exports implied by the volume index in Appendix table 6 for the period after 1965.

Table 4.3 Terms of Trade for Ghana 1900/04-1975/78

Indices 1968=100

| | Barter Terms of Trade | | | Income Terms of Trade | | |
|---|---|---|---|---|---|---|
| | Non-Cocoa | Cocoa | Total | Non-Cocoa | Cocoa | Total |
| 1900/04 | 129.0 | 112.4 | 117.2 | 14.0 | 0.6 | 4.1 |
| 1905/09 | 127.0 | 98.2 | 106.4 | 24.2 | 3.0 | 8.1 |
| 1910/14 | 111.9 | 84.7 | 92.6 | 26.1 | 9.2 | 13.3 |
| 1915/19 | 70.7 | 58.0 | 61.5 | 16.2 | 13.9 | 14.5 |
| 1920/24 | 80.6 | 43.2 | 54.0 | 13.7 | 18.7 | 19.7 |
| 1925/29 | 88.6 | 55.4 | 64.7 | 23.1 | 32.6 | 32.1 |
| 1930/34 | 96.4 | 37.5 | 59.8 | 36.0 | 22.1 | 30.7 |
| 1935/39 | 133.6 | 37.4 | 64.8 | 67.0 | 26.5 | 42.4 |
| 1940/44 | 88.4 | 16.2 | 36.9 | 52.7 | 8.3 | 19.7 |
| 1945/49 | 65.3 | 44.9 | 50.6 | 40.8 | 26.3 | 30.5 |
| 1950/54 | 81.8 | 92.5 | 89.5 | 67.2 | 55.8 | 59.7 |
| 1955/59 | 90.4 | 90.5 | 94.0 | 97.8 | 54.0 | 68.9 |
| 1960/64 | 81.1 | 65.2 | 69.7 | 93.3 | 67.8 | 74.9 |
| 1965/69 | 87.3 | 76.4 | 79.5 | 84.9 | 81.0 | 83.1 |
| 1970/74 | 111.9 | 113.5 | 113.0 | 114.2 | 119.2 | 117.8 |
| 1975/78 | 143.9 | 178.9 | 168.9 | 98.3 | 140.5 | 128.3 |

Source: Appendix table 9.

per capita GDP in 1960 was twice that of 1911. We have from Ghana, Economic Survey (1971-72) and World Bank (1980) a 1968 price estimate for 1960 of per capita GDP of NC 220 implying, following Szereszewski, a figure for 1911 of NC 110. We have used this figure to rework Szereszewski's GDP accounts for 1891-1911 at 1911 prices by scaling up his figures to give 1968 price estimates. The procedure simply assumes that the proportion of the components in total GDP remain the same. The results are presented in table 4.1. We have collected evidence on all the components of GDP except consumption and investment, which we have used to construct the GDP figures for the period 1911-1939.

In 1911 our estimate for exports is NC 41 million, of which 56 per cent was cocoa. From 1911 to 1939 the volume of exports grew by five times, non-cocoa exports by nearly three times, and cocoa exports by seven times (appendix table 6), giving a total figure for 1939 of NC 205 million, of which cocoa was 77 per cent. The growth rates to give 1919 and 1929 figures were also taken from appendix table 6. If nominal government expenditure is deflated by an index of urban wage rates, then from 1911 to 1938 real public consumption approximately doubled (appendix table 12). We believe this to be an underestimate for reasons we give below. Table 4.1 assumes a rise of 2.6 times between 1911 and 1939. Constructing a volume series for imports is complicated by inconsistent series constructed by Kay (1972) and reproduced in appendix table 8. One measure (appendix table 8, column (3)) gives the volume measure obtained by deflating nominal import values by Kay's import price index. This index shows a rise in import volumes of only 33 per cent between 1911 and 1939. An alternative measure derived by aggregating volume indices from Kay (appendix table 8, column (4)) shows import volume growth of 2.5 times over the same period, a greater increase than in the nominal value of imports. While this volume growth figure is clearly too high, we believe that Kay's price index greatly overstates the price rise between 1911 and 1939. Kay's price index is a Laspeyre's index based on 1926 weights. Thus we would expect the index for 1911 to understate the 'correct' price index, while the 1939 index would be overstated.(5) That this is so can be inferred from a price index constructed by Ady (1949) (reproduced in the sources to appendix table 8) which shows a fall in prices between 1921 and 1939 of 60 per cent, whereas the Kay index shows a fall of only 40 per cent. The difference is readily accounted for by the different quantity weights of the two series as Ady's series is based on 1938 volumes. Linking the Kay and Ady indices would imply an import price level in 1939 of approximately the same level as 1911. Thus it is possible that the rise in the nominal value of imports between 1911 and 1939 is the same as the rise in real import volumes and that is the assumption of table 4.1.

We have little direct information on the largest component of GDP which is consumption. We seek to infer a figure for 1939 by a comparison with 1950. If we assume per capita consumption is unchanged between 1939 and 1950 we would arrive at a figure for 1939 of NC 610 million. Between 1939 and 1950 the income terms of trade improved by at least 50 per cent (appendix table 9) whilst population grew by approximately 25 per cent. Real wages in 1950 were below their 1939 level, possibly by as much as 30 per cent (appendix table 11). Even for the trade sector which saw an improvement in its income, not all the real income gain to the economy accrued to the producer so to assume a 25 per cent lower level of real per capita consumption in 1939 than in 1950 would seem a very conservative estimate for 1939. This we do, giving a figure for 1939 of NC 460 million for total private consumption.

In table 4.1 we have disaggregated this total between domestic consumption and imports. The growth rate of domestic consumption between 1911 and 1939 implied by our calculation is 3.8 per cent per annum, nearly twice the assumed rate of population growth. Szereszewski explicitly assumes in his calculation for 1891-1911 that this category of consumption grows at the same rate as population. In his case this is a reasonable assumption as even by 1911 the foreign trade sector only accounted for 5 per cent of GDP. (The bottom two lines of tables 4.1 and 4.2 disaggregate GDP between the domestic and foreign sectors.) However, by 1939 over 30 per cent of GDP came from the foreign sector. Between 1911 and 1939 the income terms of trade improved by at least three times (appendix table 9). In absolute amounts at 1968 prices between 1911 and 1939 the income gain in the traded sector amounted to at least NC 120 million. Assuming none of this income gain was invested, an increase in consumption of approximately NC 120 million is implied, over and above the increased consumption due to constant food output per capita. Thus the domestic private consumption figure in table 4.1 includes this income gain from the traded sector.(6)

We have not collected new information on investment. In 1911 investment was estimated at 18 per cent of GDP by Szereszewski (1965) and at 14 per cent of GDP in 1950 by World Bank (1980). We assume the proportion to have declined steadily to 10 per cent in 1939, again to give us a conservative estimate. This is the final assumption we need to construct our GDP estimate for 1939 which in total is NC 668 million, giving per capita GDP of NC 190, 16 per cent below the level of 1950.

As a check on our figures for 1939 we consider whether the volume growth implied for the period 1939 to 1950 in tables 4.1 and 4.2 is consistent with our detailed data sources in the appendices. Given our estimate for real public consumption in 1939 the World Bank (1980) figure for 1950 implies that this category of expenditure rose by 2.5 times over this period. Appendix table 12 indicates a rise of 2.1 times, implying that our estimate for 1939 is a reasonable one. The rise between 1939 and 1950 for exports in tables 4.1 and 4.2 of just over 10 per cent is broadly consistent with appendix table 6, which shows a rise of 3 per cent. For import volume growth the figures in tables 4.1 and 4.2 imply a growth of 2.3 times between 1939 and 1950. This is higher than both the Kay series given in appendix table 8, both of which give very different results, as was true also over the 1911 to 1939 period. Appendix table 8 column (3) gives a rise in import volumes of only 75 per cent, while the aggregate volume index gives a rise of nearly twice. To check which of these is the more accurate we have calculated our own price index over the period 1939 to 1950, allowing the weights to change every five years. In doing so we reduce the inflation implied by the Kay index from 365 per cent to 314 per cent. This change implies a volume import growth of just over two times from 1939 to 1950, broadly consistent with the second Kay index. Although the import volume growth implied in tables 4.1 and 4.2 remains above the level implied by the data in the appendix, the discrepancy does not seem large in the context of such major changes in overall magnitude.

Our final calculation in the table is to revalue both components of exports to allow for the changing terms of trade given in detail in appendix table 9. By subtracting the adjusted value of exports from the constant price series for exports we derive GDY as explained in section 2.4. This we do over the whole period 1891-1974 so we are now able to compare both aggregate and per capita GDP and GDY growth rates over the period 1891-1939 and from 1950-1974. We are also able to assess the empirical relevance of the open economy model discussed in chapters 1 and 2.

From 1891 to 1939 GDP/capita rose by 2.0 per cent per annum, GDY by 1.6 per cent per annum. From 1950 to 1974 there was no rise in GDP/capita, while GDY/capita increased at a rate of only 0.3 per cent per annum. Between 1911 and 1939 total exports increased by 5.7 per cent per annum (cocoa exports grew by 6.8 per cent per annum, non-cocoa exports by 3.6 per cent per annum). In contrast, from 1950-1974 the volume of exports grew at less than half the rate achieved up to 1939, 2.4 per cent per annum (cocoa exports rose by 2.6 per cent per annum, non-cocoa exports increased by 1.8 per cent per annum).This comparison of the behaviour of foreign sector output between the two periods overstates the 1950-74 achievement as by 1965 export volumes had peaked and from 1965 they have been falling. Even over the period 1950-1965 export volume growth at 4.4 per cent per annum remained below that achieved before 1939.

We have stressed in earlier chapters the importance of distinguishing between non-cocoa exports, where growth is supply-constrained, and cocoa exports where demand plays some role, as shown by the model of chapter 2. A useful comparison can be made between 1929 and 1939 (the years of the 'great depression') when non-cocoa exports grew by 6.5 per cent per annum and the period since 1950 when no decade has seen any but minimal growth. In this sector demand plays no role, so the continual stress on demand factors in the literature quoted above is wholly misleading, both as to the determinants of growth and the facts of growth.

In constructing our GDP estimates we have already referred to both the barter and the income terms of trade. Table 4.3 presents the figures over our whole period. It is clear that over the period 1900/04 to 1935/39 the decline in Ghana's overall barter terms of trade is entirely concentrated in cocoa exports. For non-cocoa exports the barter terms of trade show a continuous fall from 1900/04 to 1915/19 and then a continuous rise to 1935/39. A similar, although not identical, pattern for non-cocoa prices can be observed over the period 1935/39 to 1975/78 with a decline to a low point in 1945/49 and then a rise to a peak in 1975/78. The pattern for cocoa exports is quite different. By 1935/39 the barter terms of trade are about one third of their level in 1900/04. It will be noted that this is exactly the prediction of the vent-for-surplus model of chapter 2 once the economy becomes a 'large' producer of its export crop. As the barter terms of trade do not reflect the price to the producer we defer a fuller consideration until section 4.3 below. The barter terms of trade for cocoa reach a trough in 1940/44 and between then and 1975/78 fluctuate, rising over the decade 1940/44 to 1950/54, falling until 1960/64 from which point they rise until by 1975/78 they exceed the level of 1900/04. It will be noted that the barter terms of trade for cocoa over the period after 1950/54 are always above the level from 1915/19 to 1935/39, a point to which we return in chapter 6.

Table 4.3 also shows the income terms of trade. From 1900/04 to 1935/39 the income terms of trade increased ten times or, allowing for population growth, over five times on a per capita basis. Although the rise was mainly in the cocoa sector where the income terms of trade improved by over 800 per cent (from 1905/09) the gain in the non-cocoa sector of nearly 500 per cent is equally important for understanding that the views expressed above as to the sole importance of cocoa are wholly misleading as to the growth pattern of the economy. Although the income terms of trade were to improve in the period after 1945/49 the gains were modest by the standards of pre-1939 growth. By 1975/78 the income terms of trade were three times their 1935/39 level, of the same order of magnitude as population growth. Further, whereas the enormous gains in the income terms of trade over the period 1900/04 to 1935/39 were associated with a halving of the barter terms of trade, the bulk of the gain in the income terms of trade from 1935/39 to 1975/78 was due to improved barter terms of trade. This simply reflects the fact that the volume of exports at the end of the 1970s was returning to the level of the 1930s (appendix table 6).

Table 4.3 thus shows for Ghana the irrelevance of a concern with the barter terms of trade which has so dominated policy discussion in development. When the barter terms of trade have moved most rapidly against the economy its real income, in both the trade and non-trade sectors, has grown most rapidly. A period from 1960/64 to 1975/78 when the barter terms of trade more than doubled saw no rise at all in export volumes, with the result that the income terms of trade only increased by 70 per cent and per capita GDY by only 12 per cent (table 4.2).

Finally in this section we consider whether the implications of the open economy model of Seers is consistent with the balance of payments experience of Ghana over its twentieth century economic history.

We showed in section 2.4 that the Seers model implicitly uses the elasticity approach to the balance of payments. The approach abstracts from the problems of growth and assumes Keynesian unemployed resources. The model implies that high growth rates in the short run will lead to balance of payments problems, which will lead to contraction and reduced levels of incomes. The balance of payments 'constraint' will prevent growth, so that only if the institutions of an open economy are abandoned will sustained growth prove possible.

We only have data on the visible balance of trade for the period until 1950. This balance was in deficit from 1900-1904 due largely to public sector investment in the railways, but from then on in only six of the following 46 years was visible trade in deficit (appendix table 9). Over the period when rapid growth was proceeding Ghana experienced no sustained balance of payments problems, while in the period since the mid-1950s when per capita growth ceased, the economy had continuous balance of payments problems. These basic economic facts of Ghana's history are wholly inconsistent with the Seers model. It follows that the rationale offered by the Seers model for 'closing' the economy is without empirical basis.

Having examined the aggregate growth of the economy we now consider the cocoa sector in detail.

## 4.3 Real Income Growth in the Cocoa Sector 1891-1975

It is to the cocoa sector that we have argued that the vent-for-surplus model must be applied. In chapter 3 we sought to document the outputs, inputs and productivity of the cocoa sector over time. In chapter 2 we set out the implications of the vent-for-surplus model, which in summary form were:

(a) the new crop offers a substantially greater return than alternative crops;

(b) that surplus land is available;

(c) that the increased return raises the supply of effort (either in the form of more labour hours or migration or both) and the supply of capital to the sector;

(d) that if surplus labour hours are associated with a constant real cost of labour, then food output would remain constant;

(e) that growth did not involve substantial productivity change;

(f) that the supply function relating price of output to quantity supplied would be negatively sloped over the range where economic rent was available from the exploitation of the crop and the economy was 'large' relative to its export market;

(g) that two possible causes of reducing the long run growth of the sector to zero are either the exhaustion of surplus land or the lowering of the return to effort and saving such that further expansion of acreage is unprofitable;

(h) that before this long run point is reached substantial income gains accrue to the sector.

Chapter 3 considered points (b) and (e). We argued that surplus land remained available and that growth occurred with declining productivity until 1939 and a modest rise after 1950. However, the level of productivity in the middle of the 1970s remained much below the level of the early twentieth century. We now wish to consider the other implications of the vent-for-surplus model and in doing so investigate the extent of the real income gains that accrued to the cocoa sector.

That the new crop offered a substantially greater return is argued by Szereszewski (1965) and Ingham (1981). Ingham (1981: 21) computes an average real return per day for cocoa and compares this with one for palm kernals, showing the return on cocoa to be in 1911 three times that on palm kernals. An alternative calculation of the comparative real return on cocoa farming by comparing it with working as a labourer: in 1911 our index for wage rates (appendix table 11) shows earnings of 9d/day (= £13/year). By comparison, the owner of a 3-acre cocoa farm could have an income of £17/year.

Szereszewski (1965) makes the basic point that such a massive rise in cocoa output must have involved a higher return than that available elsewhere and on this point Ingham agrees. However, Ingham seeks to argue that the elasticity of response of effort defined by

$$\frac{\Delta W/W}{\Delta P/P}$$

was low,

where $\Delta W$ = the change in the volume of labour inputs with the introduction of cocoa;

$W$ = pre-cocoa volume of labour inputs;

$\Delta P$ = the change in real remuneration to labour with the introduction of cocoa;

$P$ = pre-cocoa level of real remuneration to labour.

There are two problems with this claim. The first is that Ingham grossly underestimates labour inputs due indirectly to overestimating yields/acre (a figure of 1.8 ton/acre is quoted). The second and more important objection is that the issue is not the size of this elasticity (which for an unemployed labourer would be zero) but that if the return is greater than that available elsewhere, factors move into the sector. Ingham (1981: chapter 3) appears to regard the migration documented by Hill (1963) for Ghana and the studies of Nigeria by Berry (1975) as alternative explanations to the vent-for-surplus. To regard cocoa supply as a response to a profitable investment opportunity as an alternative explanation to neoclassical analysis (as Ingham does) seems simply a perverse use of words. There is no dispute that factors did move into this sector and that returns were higher than those available elsewhere. On this point all evidence agrees and that such was the case is a direct inference from the vent-for-surplus model of chapter 2.

Ingham (1981: 22) argues that "increasing output of cocoa and declining output of palm cannot be explained in terms of simple price/supply relationships because the price of palm was rising throughout the period in question and the price of cocoa was falling". However, our model makes exactly this prediction. More generally, table 4.4 gives five-year averages of cocoa output (column (1)) and real producer price (column (2)) for the period 1900/04 to 1975/79. Real producer price is the nominal producer price deflated by the retail price index. Over the period 1900/04 to 1920/24 which we have identified as the first vent-for-surplus phase, output grew continuously and real price fell continuously. From 1920/24 to 1940/44 output grew by only 1.5 per cent per annum, less than the estimated rate of population growth, and real prices fluctuated showing no pronounced trend. This data, we would argue, is fully consistent with our model. The second vent-for-surplus phase we have identified from 1950/54 to 1965/69 was much shorter than the first. Again, as table 4.4 shows, real output approximately doubled over this period while real producer prices more than halved. There is, however, a very significant difference between the two vent-for-surplus periods in the relationship between producer and world prices and in the level of world prices during the second vent-for-surplus phase. This is shown in table 4.4, columns (4) and (5). In the first phase, 1900/04-1925/29, producer prices were approximately 75 per cent of world prices, in the period after 1950 they were less than half. As is well known, this was primarily due to the policies of the marketing boards. The second point to note is that while real world prices fell in both vent-for-surplus phases, the fall was much greater in the first phase than in the second. However, in the second phase real producer prices fell to lower levels in the 1970s than the level of the 'great depression' of the 1930s. Indeed, by the end of the 1970s real producer prices had been reduced to a lower level than during the Second World War. The implication of our model, which we argue this data fully supports, is that while prices remain above the equilibrium level output will rise, while once prices are below this level output will fall. It seems clear that real prices have been below this level throughout the 1970s.

Table 4.4 Output, Total and Producer Income for the Cocoa Sector in Ghana 1900/04-1975/79

| | Output (000 tons) | Real Producer Price £1968/ton | Real Income £1968m | Real World Price £/ton | Producer / World |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| 1900/04 | 2.2 | 432.4 | 1.0 | 357.8 | 75.0* |
| 1905/09 | 11.3 | 384.7 | 4.4 | 318.5 | 75.0* |
| 1910/14 | 40.9 | 334.0 | 13.7 | 275.4 | 75.0* |
| 1915/19 | 96.6 | 217.8 | 21.0 | 187.9 | 73.4 |
| 1920/24 | 167.6 | 164.7 | 27.6 | 140.4 | 72.4 |
| 1925/29 | 224.4 | 237.5 | 53.3 | 179.6 | 84.1 |
| 1930/34 | 228.8 | 143.2 | 32.8 | 122.0 | 73.3 |
| 1935/39 | 278.4 | 148.1 | 41.2 | 121.4 | 78.2 |
| 1940/44 | 226.6 | 69.8 | 15.8 | 52.8 | 73.2 |
| 1945/49 | 223.2 | 188.8 | 42.1 | 145.5 | 65.5 |
| 1950/54 | 235.1 | 267.4 | 62.9 | 300.2 | 48.0 |
| 1955/59 | 233.3 | 272.1 | 63.5 | 309.7 | 55.5 |
| 1960/64 | 400.0 | 169.9 | 70.0 | 189.6 | 58.4 |
| 1965/69 | 421.0 | 92.4 | 38.9 | 190.1 | 50.2 |
| 1970/74 | 414.1 | 91.0 | 37.7 | 235.7 | 38.7 |
| 1975/79 | 322.9 | 51.9 | 16.8 | (419.6) | (31.4) |

*By construction (see appendix table 4 for details).
( ) numbers are averages of 1975 to 1978.
Column (1) Appendix table 1.
Column (2) Appendix table 4, Column 8 and Annex.
Column (3) = Column (1) x Column (2)/1000.
Column (4) Appendix table 4, Column 9.
Column (5) Appendix table 13, Column 7. The column gives the ratio of <u>nominal</u> producer to <u>nominal</u> world price of cocoa.

Having considered points (a) and (c) the next point we need to consider is (d), whether Sen's condition for constant output in the food sector was empirically correct. In the context of West Africa it has been widely argued that food output per capita did not fall during the first vent-for-surplus phase. For example, Johnston (1964: 152) argues that

> "indirect evidence suggests that the production of food has probably increased at about the same rate as the growth of the population. The present dependence on cereals, roots or tubers or plantains - cheap starchy staple foods of the sort that invariably bulk large in the diets of low income communities - is so great that it is hard to believe that African diets 50 or 100 years ago were any more dependent on these starchy staple foods. We may infer, therefore, that there has probably been little qualitative improvement in the average diet; and it also seems unlikely that per calorie intake has increased appreciably. But neither is there any evidence that suggests a general reduction in per capita food supplies."

Import figures clearly support this conclusion for the period until 1939.(7) The argument is less clear in the post-war period. The GDP estimates for the period 1950-1974 disaggregate private sector consumption into local food and a remainder (table 4.2). Although there is considerable uncertainty about these figures it seems clear that over the period 1950 to 1970 food output did not grow with population.(8) Killick (1978: 191) argues that "it was clear at the beginning of the sixties that powerful socio-economic forces were reducing the supply of agricultural labour relative to the supply of non-agricultural labour". This reduction in labour supply, Killick argues, was allied to a failure to achieve technical progress in agriculture, with the results that food output per capita fell. In contrast, Seidman (1978: 53) argues that "the evidence, fragmentary though it is, indicates that the expansion of cocoa output has probably reduced the production of food crops for domestic use as cocoa farmers have come increasingly to rely on purchases of staple foods." However, evidence of specialisation is not inconsistent with per capita output not changing if non-cocoa farmers increase their output. The data for the period since 1950 are probably inadequate to form a judgement but the argument advanced by Johnston is convincing for the first vent-for-surplus phase. Killick's argument points to an important difference between the two phases of growth. In the second urban employment opportunities were expanding rapidly, unlike in the first phase. This may account for the different pattern of food output between the two periods.

We would argue that in the first vent-for-surplus phase food output per capita remained constant due partly to the fulfilment of Sen's condition for the existence of surplus labour hours in the food sector, partly to the divisibility of labour supply in a growth process that remained almost entirely rural and partly due to the technical complementarity of food output and newly planted cocoa.[(9)]

There is an alternative explanation which could be advanced for the failure of food output per capita to fall in the first vent-for-surplus phase of growth. Evidence, for example, in Galletti, Baldwin, Dina (1956) suggests that while some specialisation occurred between food and cocoa, this specialisation was far from complete and that, in particular, the output mix chosen was not a profit maximisation one. The economic problem posed by the data is why cocoa farmers failed to reduce their food output and capture the income gains available from increased specialisation. The alternative explanation is that capital markets for savings were so imperfect that specialisation which relied on market rather than household supply of food was unacceptably risky. This explanation differs from the vent-for-surplus view which sees low relative food prices persisting while the disequilibrium remains between the returns available in the cocoa sector and those available in other sectors. However, the explanations are not mutually exclusive and one aspect of the failure to specialise more completely may be due to market failure in markets for savings. We consider this issue in chapter 5.

The broad outlines of the growth of the cocoa sector were given in section 3.2. On the basis of table 4.4, growth on a per capita basis was over by 1925/29 and on an aggregate basis by 1935/39. The experience after 1950 repeats a similar pattern but on a much reduced scale. The growth during the 1960s was at a very high rate but by 1965/69 growth on an aggregate basis had ceased. What brought growth to an end? This is the central question in which we are interested in our analysis of the vent-for-surplus model.

One indicator we have for the return on effort in the cocoa industry is the real producer price already given in table 4.4. In chapter 3 we have argued that net new plantings probably continued until the 1940s. This would imply that the real producer price before 1940 made investment in cocoa profitable, at least on an aggregate basis. From table 4.4, column (2) we see that the period 1940/44 witnessed the low point in the pre-war period for real producer price of £69.8/ton. The price at which it is profitable to undertake substantial new investment in cocoa is undoubtedly substantially above this level but a price of approximately £100/ton (at 1968 prices) appears to be a minimum for growth to continue. In chapter 3, table 3.8 we also estimated that net new plantings became negative in the latter 1960s when, as table 4.4 shows, real producer prices once again fell below £100/ton. By the end of the 1970s the real price had fallen below the level of the 1940s, being 12 per cent of the level of 1900/04.

The real return on cocoa investment depends not on the absolute price of cocoa but on its relative price to other output and on costs. This point is investigated in table 4.5, where column (4) shows the ratio of food prices to cocoa producer prices and column (5) the ratio of urban wages to cocoa producer prices. For column (4) the ratio is only available from 1940/44. However, over the second vent-for-surplus phase of Ghana's growth it is clear that from 1945/49 to 1955/59 food prices fell relative to cocoa producer prices. Since 1955/59 food prices have consistently risen relative to cocoa producer prices. By the latter 1960s when we estimate net new planting had become negative, not only was the level of cocoa prices to prices generally falling, but relative food prices were rising, suggesting the profitability of switching output from cocoa to food. This finding is consistent with the GDP figures shown in table 4.2 where from 1965 to 1970 food output per capita having fallen since 1955 recovers markedly while cocoa output falls. This process has accelerated since the 1960s as by the end of the 1970s food prices had risen four times faster than cocoa producer prices. An implication of this analysis and a test of the underlying hypothesis is that the Ghana cocoa industry will completely disappear within the next ten years.

So far we have only considered output prices; what of labour costs to the cocoa industry? A rather crude measure of relative labour costs is presented in table 4.5 column (5), which shows urban minimum wages relative to cocoa producer prices. While this ratio fell in the 1950s its rise since then has been much less dramatic than the changes in relative output prices. It is also noticeable that the ratio remained in the post-Second World War period much below the level of the 1930s and early 1940s. The view that the substantial rural urban migration in the 1950s and 1960s was due to greatly increased wages is quite without empirical basis.

Table 4.5 Productivity, Single and Double Factoral Terms of Trade and Relative Prices for the Cocoa Sector in Ghana, 1900-1970/74

Indices 1968=100

| | Real Income/ man year/acre £(1968) | Single Factoral Terms of Trade | Double Factoral Terms of Trade | Food / Cocoa | Wages / Cocoa |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| 1900 | 79 | 198 | 660 | n.a. | 24.8 |
| 1925/29 | 40 | 103 | 231 | n.a. | 54.5 |
| 1930/34 | 20 | 57 | 118 | n.a. | 120.0 |
| 1935/39 | 19 | 57 | 112* | n.a. | 116.5 |
| 1940/44 | 6 | 16 | n.a. | 103** | 167.8 |
| 1945/49 | 14 | 35 | 69* | 50 | 74.1 |
| 1950/54 | 20 | 73 | 115 | 33 | 42.5 |
| 1955/59 | 20 | 72 | 101 | 36 | 49.2 |
| 1960/64 | 17 | 74 | 92 | 59 | 83.3 |
| 1965/69 | 9 | 75 | 78 | 114 | 104.7 |
| 1970/74 | 8 | 108.4 | 98 | 121 | 113.9 |
| 1975/79 | n.a. | n.a. | n.a. | 323 | 109.5 |

n.a. not available.
*due to gaps in the data these are averages for 1935/38 and 1946/49, respectively.

**this is an average of 1939, 1941-44.

Sources: Column (1) Appendix table 3, column 7.
1900 is obtained by assuming the same level of productivity as for 1925, and the average real producer price for 1900/04 from Appendix table 4 annex.
Column (2) Appendix table 7, column (4).
Column (3) Appendix table 7, column (6).
Column (4) Appendix table 11, column (7).
Column (5) Appendix table 11, column (6).

The measure of relative real return and costs we have considered so far do not take into consideration underlying productivity changes. Insofar as these can be measured, they more accurately reflect the returns to labour. We have used the evidence presented in chapter 3 to calculate such measures. Table 4.5, column (1) gives a measure of real income/man year/acre. The figure for 1900 is a conservative estimate assuming a productivity level in 1900 the same as that estimated for 1925. The data show that real income/man year/acre approximately halved between 1900 and 1925/29 and halved again during the 1930s, and by 1940/44 was at a level less than 10 per cent the level of 1900. The period since 1945 shows a rise from 1945/49 to 1960/64 comparable with that of the 1930s but a decline in the latter 1960s to a level less than half the level during the period of new investment. These figures seem wholly consistent with the argument already advanced that during the 1940s and in the period since the latter 1960s the real return per effort has fallen to levels which no longer make investment profitable. This evidence is wholly consistent with our argument that the growth process was brought to an end not by the exhaustion of surplus land but by the lowering of the return to investment and effort below the level which could sustain growth.

We turn finally to the extent of the real income gains to the cocoa sector as a result of the vent-for-surplus phase of growth. In this respect it is necessary to distinguish the gains to the cocoa sector from the gains to the economy. Up to 1939 the tax rate on cocoa was very modest, being on average below 10 per cent (appendix table 13), whilst since 1939 a very much larger proportion of cocoa income has been taken by the state. This is due, as is well known, to the extent of the taxes on the producers operated by the marketing board established in 1939, Bauer (1954), Beckman (1976), Bates (1981).

Leith (1974: 13) calculates that over the period 1955-1960 the tax rate on cocoa exports has averaged 33 per cent. Another indicator of the difference between the pre- and post-1939 period can be found in table 4.4, column (5), where the ratio of producer to export price of cocoa is given. From 1915/19 to 1935/39 this ratio ranged from a low of 72.4 per cent to a high of 84.1 per cent. Since 1950/54 the ratio fluctuated around 50 per cent, until the 1970s when it fell below 40 per cent. Thus when considering the cocoa sector up until 1939 the producer and economy gain is broadly the same; this is not true after 1939.

For the cocoa sector a measure of producer income gain is given in table 4.4, column (3), where real income is real producer price x output. As the table shows, real income grew continuously from 1900/04 to 1925/29, the ten year growth rates being,

| | Growth Rates of Cocoa Producer Income |
|---|---|
| 1900/04 - 1910/14 | 1370 % |
| 1910/14 - 1920/24 | 100 % |
| 1920/24 - 1930/34 | 18 % |

If we exclude the period until 1910 as being too small to form a useful base, then from 1910/14 to the pre-Second World War peak real income grew by 9 per cent per annum. On whatever basis the calculation is done, the real income gain to the cocoa sector during the vent-for-surplus first phase was very substantial.(10) We have already argued in section 4.2 that this income led to substantial growth of the domestic economy.

We now consider the second vent-for-surplus phase of growth from the late 1940s. Again table 4.4, column (3) shows that real producer income stagnated between 1925/29 and 1950/54, while the real income gain to 1960/64 was very modest by the standards of the first vent-for-surplus phase. Again growth rates were,

| | Growth Rates of Cocoa Producer Income |
|---|---|
| 1950/54 - 1960/64 | 11 % |
| 1960/64 - 1970/74 | -47 % |

Not only was the producer gain modest (lower than any of the growth rates until 1930/34) but any gain in the 1960s was wholly reversed in the 1970s. By 1975/79 real producer income in the cocoa sector had been reduced to the level of 1940/44, although of course population more than tripled over this period (tables 4.1 and 4.2).

Thus in the second vent-for-surplus phase the majority of the real income gain accrued to the public sector. We have already noted that the proportion of the world price going to the producer has declined steadily. We have also noted in table 4.2 that this increase in income accruing to the public sector did not lead to substantial growth. In fact, by 1974 GDP/capita was at the same level as 1950 (table 4.2). The reasons for the failure of growth have been extensively analysed [Killick (1978), Leith (1974)] but, to our knowledge, no mention has been made of the contrast between 1891 and 1939 and the period since 1950. A private sector growth process was in one period very successful, the public sector growth process after 1939 was a total failure.

However, it would not be correct to infer that without public sector intervention the market oriented growth process could have repeated the success of the period until 1939. The fundamental problems facing the cocoa sector are shown in the single and double factoral terms of trade for the sector shown in table 4.5, columns (2) and (3). The single factoral terms of trade show,

$$\frac{P_X}{P_H} X / L_X$$

i.e. how many imports one unit of labour can buy. The double factoral terms of trade show,

$$\frac{P_X \cdot X/L_X}{P_H \cdot H/L_H} = \frac{P_X X}{P_H H} \frac{L_H}{L_X}$$

i.e. assuming trade balance the ratio of earnings of labour in the developed country to earnings in Ghana. We have chosen to compare the UK industrial sector with the Ghana cocoa sector. This comparison of course is a rather 'easy' one for Ghana as UK industrial productivity growth has been one of the slowest in Europe since 1950, Prais et al (1981).(11) From 1900 to 1935/39 the single factoral terms of trade were reduced by more than one third primarily due to the terms of trade effect. From 1950/54 onwards, the single factoral terms of trade were roughly constant as rising prices in the 1970s compensated for falling productivity. In contrast, the double factoral terms of trade have fallen continuously since 1900 (with the exception of 1950/54). The reason is clear, productivity in Ghana has at best not fallen, while productivity growth in the UK industrial sector, while modest by comparative standards, has been positive.

These figures show clearly the paradox of why rapid growth is consistent with rapidly falling relative real wage rates. From 1901 to 1939 the Ghana economy grew more rapidly than the UK. However, over this period the UK worker relative to the Ghanaian worker became six times richer. The Ghanaian growth process depended not on a capital deepening growth process but on capital widening. This widening raised income, not productivity. This weakness was, we argue below, inherent in the Ghana economy. Its solution was the major task facing the public sector in 1939. The tragedy of the Ghana economy is due to the fact that not only did the public sector not address itself to this problem, it was then - and remains so until the present - largely ignorant of its existence.

# Chapter 5. The Formulation of Economic Policy in Low Income Countries

## 5.1 Introduction

In this chapter we turn from a consideration of positive development economics to normative policy issues. Development economic policy is viewed here as the application of economic analysis to the economic problems of low-income countries. Such a definition of development economic policy will meet two objections. The first is that for low-income countries the political and social context is not separable from the economic. The second is that insofar as they are separated a study of development economic policy, so defined, will exclude all the major problems faced by low income countries. These two objections form the basis for arguing the need for political economy rather than economics. In this chapter we will argue that neoclassical economics and political economy are not alternative approaches to policy problems but are applicable to different classes of problems. Neoclassical economics explains the causes of poverty and points to the required optimal policy choices. Political economy explains why actual, invariably non-optimal, policy choices are made. Thus political economy cannot be used to recommend policy choice while neoclassical economic policy analysis will be quite useless as a predictor of actual policy.

Such a view of political economy does not accord with the perspective of those who advocate such an approach. The belief in the importance of political economy is associated with certain empirical beliefs. In summary, these are that market oriented economies cannot grow (or that such growth as they achieve is limited in extent and confined to a rich elite), that planning is necessary for sustained growth, that market prices are systematically distorted from social prices and that public sector intervention in the form of quantitative control is essential.(1) In chapter 4 we have already referred to authors holding these views, Seers (1963), Amin (1973), Seidman (1978). The belief that market economies cannot grow or that planning is either necessary or sufficient for growth is, as chapter 4 showed, wholly without empirical basis for Ghana.

In this chapter we consider the other central objections advanced by these authors to markets. We argue that all the normative objections to markets being allowed to work depend <u>either</u> on the assertion of the existence of (and by implication the empirical importance of) some form of market failure <u>or</u> on the importance of allowing for income distribution considerations allegedly ignored by neoclassical analysis.(2) However, the first of these objections to markets has been extensively analysed within the neoclassical economic tradition so by analysing the theory of economic policy in section 5.2 we cover fully this theoretical objection. In section 5.3 we consider the empirical importance of market failure for the Ghana economy. In section 5.4 we return to political economy, by which we mean the analysis of the political rationale for economic decisions. We argue there that insofar as Marxist analysis is more than an assertion of the empirical importance of market failure, it relies on the second objection to markets, namely that neoclassical analysis fails to recognise the political importance of income distribution. We show that such an approach can provide an economic explanation of political decisions which are, on allocative grounds, 'irrational'. We begin, however, in section 5.2 with the theory of optimal public sector policy.

## 5.2 The Public Sector in the Theory of Economic Policy

Two broad approaches to the theory of the public sector in neoclassical economic policy analysis can be identified. The first begins with the theory of competitive markets and asks under what conditions markets ensure an optimal allocation. In this approach the public sector is viewed as a 'deus ex machina' for correcting market failures. The second approach assumes the non-obtainability of a first best optimum and asks what conditions will characterise the second best optimum.

The first approach leads to the fundamental welfare theorem of the competitive market. The result and the required assumptions are summarised in Arrow (1971: 6).

> "A number of additional assumptions are made at different points in the theory of equilibrium, but most are clearly factually valid in the usual contexts and need not be mentioned. The two hypotheses frequently not valid are (C), the convexity of household indifference maps and firm production sets and (M) the universality of markets. ... The relations between Pareto efficiency and competitive equilibrium are set forth in the following two theorems:
>
> (1) If (M) holds, a competitive equilibrium is Pareto-efficient. This theorem is true if (C) does not hold.
>
> (2) If (C) and (M) hold, then any Pareto-efficient allocation can be achieved as a competitive equilibrium by a suitable reallocation of initial resources.
>
> When the assumptions of proposition (2) are valid, then the case for the competitive price system is strongest. Any complaints about its operation can be reduced to complaints about the distribution of income, which should then be rectified by lump-sum transfers."

It is the impossibility of lump-sum transfers that is the starting point for the second approach to the theory of the public sector. However, before outlining this second approach we must note that all market failures involve a violation of one (or more) of the conditions of the above theorems. Either the market is not competitive, or convexity does not hold or markets do not exist. Externalities are not a separate form of market failure. Arrow (1971:16) argues that "externalities can be regarded as ordinary commodities" and "it is not the mere fact that one man's consumption enters into another man's utility that causes the failure of the market to achieve efficiency. There are two relevant factors which cannot be discovered by inspection of the utility structures of the individual. One, much explored in the literature, is the appropriability of the commodities which represent the external repercussions; the other, less stressed, is the fact that markets for externalities usually involve small numbers of buyers and sellers". Thus the existence of externalities is a special case of markets not existing. Arrow identifies three fundamental reasons why markets may not exist: (1) exclusion costs are too high; (2) the costs of communication and information, including both the supplying and the learning of the terms on which transactions can be carried out; and (3) the costs of disequilibrium. These costs may be so high as to prevent the market from existing but intermediate stages can be readily envisaged in which, while the market exists, it is highly imperfect. Rural finance and insurance markets are examples of this. Imperfect markets are ones in which pricing fails to reflect social benefits and costs. It is this problem that is considered by Worcester (1969) who shows that "all external effects are found in principle to be reducible by correct input pricing to economies or diseconomies" (p.885) and that "any technological economy or diseconomy can be converted into a pecuniary one by appropriate pricing of inputs" (p.884). Pecuniary externalities, unlike technological externalities, do not give rise to market failure because they do operate through markets. Thus if markets do exist and prices reflect social returns, there are no allocative grounds for public sector intervention.

A necessary condition for markets to exist is that property rights be well defined and many of the instances of externality that have been identified arise due to the failure of such rights to be well specified. If such rights are well specified and if costless negotiation is possible, Coase's (1960) theorem argues that allocation will be efficient. The importance of the proviso that negotiations be costless has been stressed by Baumol (1972) who argues that if the market is competitive then costless negotiation will not be possible and a Pigovian tax or subsidy is necessary for efficient allocation. In an important extension of the argument Baumol also argues that given the practical problems posed by imposing Pigovian taxes or subsidies direct public sector control may enable society to move closer to an optimum. The conclusion of this argument in the literature is that where property rights in the commodity are not defined or negotiation is costly a technological externality will arise requiring public sector intervention.

Such a rationale for public sector control must appear almost irrelevant in contrast with the grand designs of planning and socialism which have dominated so much discussion of development policy but we show below that an externality of precisely this form has played a very important part in Ghana's economic history.

The first approach could be accurately defined as first best economic policy. One problem with this approach, to which we have already referred, was the assumed possibility of lump-sum transfers. A second was the theory of the second best due originally to Lipsey and Lancaster (1956) which showed that if all the first best conditions were not fulfilled in general none were desirable. However, it proved possible to show that even if some first best conditions were violated others remained desirable. This second approach is due to Diamond and Mirrlees (1971) who showed that if taxes (excluding lump sum taxes) can be set optimally then production efficiency remained desirable. This result has been extensively investigated in the literature and a result of central importance for economic policy emerged in the form of world prices being appropriate shadow prices for traded commodities. This result has been used in the Little and Mirrlees (1968) (1974) project appraisal methodology but the whole approach has focused attention on how weak are the assumptions which make public sector efficiency desirable.(3)

For LDCs the first of these approaches which we have outlined has, until recently, been of more importance. The major theoretical innovation in development economics was the dual economy model of Lewis (1954). The market failure identified by this model was of a socially sub-optimal level of investment in industry due to the marginal product of labour in agriculture being lower (possibly at zero) than the wage in the agricultural sector. Although this model only implied a sectoral misallocation of investment it was frequently associated with the view that there was a socially sub-optimal aggregate level of savings. It was at this point we would argue that positive analysis and normative policy became inextricably linked (and thereby confused). Lewis argued that

> "the central problem in the theory of economic development is to understand the process by which a community which was previously saving and investing 4 or 5 per cent of its national income or less, converts itself into an economy where voluntary saving is running at about 12 to 15 per cent of national income or more. This is the central problem because the central fact of economic development is rapid capital accumulation (including knowledge and skills with capital). We cannot explain any 'industrial' revolution (as the economic historians pretend to do) until we can explain why saving increased relatively to national income."
> [Lewis (1954: 416)]

The work referred to in chapter 2 which purported to show that rising income was due to industrialisation then led to the twin assertions that aggregate savings were socially sub-optimal and this sub-optimality was concentrated in the industrial sector. However, these two assertions that there is a socially sub-optimal level of investment and that there is a sectoral misallocation of investment are quite separate and neither implies the other. The dual economy suggests the second not the first. The arguments for a socially sub-optimal level of investment are partly authoritarian as in UNIDO (1972) where it is argued that intertemporal decision making is irrational and partly as in Sen (1967) that market failure due to non-cooperation is involved. In this thesis we only consider arguments related to market failure.

While labour and investment market failures were regarded as central, other arguments were generally advanced against neoclassical economics which have been cogently and comprehensively summarised by Killick (1978) who also documents their influence on the form and rationale of Nkrumah's economic policies in Ghana. Killick notes the market failures implied by externalities, indivisible investments and increasing returns to scale. The last two of these market failures are related to market size. Killick then elaborates on the argument relating to market size.

> "Small markets further tend to increase the incidence of monopolistic or semi-monopolistic industries, thereby further reducing the efficacy of market oriented policies. Factor markets were also likely to be highly imperfect in the conditions of the underdeveloped countries, creating dualistic economies, and factor prices substantially at variance with their social marginal products. Information flows were also likely to be poor, and these factors would tend to make for low elasticities of supply (which is why deteriorating terms of trade held such serious implications). Thus the price signals of the market would, at best, meet with weak responses and, at worst, with responses that were socially damaging."
> [Killick (1978: 16)]

In section 2.2 we noted the importance attached to market size by Adam Smith when discussing the potential 'productivity' gains from trade. Stigler (1951), in elaborating on the Smith theorem, argued its empirical importance in the theory of the firm. Thus the points made by Killick are of considerable importance for policy. In examining his argument we need to distinguish the foreign trade sector from the domestic agricultural market. The latter market was clearly not small and the evidence of chapter 3 overwhelmingly confirmed that market prices worked. However, the work of Bauer (1954) has shown that market failure associated with small market size led to oligopoly in the foreign trade sector. Killick's second remark that factor markets are likely to be imperfect is a market failure to which we have already referred and which we consider in section 5.3.1. In summarising what "at the beginning of the sixties a substantial (but not necessarily identical) majority" would have believed to be the two most important policies for ensuring development Killick argues for a raised level of saving and industrialisation. We have already argued that the only valid arguments for these policies are (different) forms of market failure.

A further argument was advanced by Hirschman and, Killick argues, became a core element in the doctrines of development economics, namely that industrialisation promotes greater 'linkages' than agriculture. The concept of linkage is rather nebulous but Elkan (1973: 83) gives the following very lucid account of the concept:

"Hirschman classifies industries according to whether their expansion will or will not induce further investment in other industries. He does so by introducing the concept of 'forward and backward linkage'. An industry is said to have strong forward linkage effects if it is likely to prompt the setting up of new industries using its output. For example, the setting up of a steel mill - even if it is initially no more than one using only scrap and no iron ore - is likely to give rise to a variety of steel manufactures, such as the making of steel window frames and a variety of simple steel components. Backward linkage occurs when investment in an industry gives rise to further investment in industries that supply it with inputs. Beer brewing, frequently among the first industries to emerge in underdeveloped countries, creates a demand for bottles, and then for bottle tops and eventually crates in which to transport the bottles. Final consumer goods have, by definition, no forward linkages or, at most, relatively weak ones through complementarity whilst agriculture is an example of an industry that has few backward linkages because it uses relatively few inputs, although the increasing use of artificial fertilizers, and pesticides perhaps makes this a bad example, and indeed the coming of the Green Revolution, ... with its demand for tubewell equipment, shows further that the nature of an industry's linkages is not immutable but changes in time. In general however it is intermediate industries, rather than primary product or final consumer good industries which have the most linkages. An iron and steel industry clearly has very strong forward and backward linkages but as Hirschmann says 'development ... cannot be started everywhere with an iron and steel industry just because this industry maximizes linkages' (Hirschman, 1958, p.108)."

When discussing the industrialisation strategy in Ghana Killick appears to accept the desirability of linkages:

"One of the main theoretical advantages advanced in favour of an industry-led strategy of economic development is that manufacturing is supposed to have greater linkages with other sectors and may thus be expected to induce investments and expansion elsewhere in the economy. In Ghana's case, however, the linkages did not develop, which helps to explain why industrialisation failed to galvanize the rest of the economy into more rapid growth."
(Killick, 1978: 202)

However, this misses the point. Linkages as defined above are simply another name for pecuniary externalities, and, as noted above, there is no reason to suppose <u>pecuniary</u> externalities give rise to market failure. It may or may not be the case that pecuniary externalities exist more in one sector than another but there is no social gain to be made from creating them if they do not exist and if they do exist the market will exploit them anyway. Scitovsky (1954) who originally identified pecuniary externalities as the source of market failure in poor economies implicitly argues that public sector perception of market interdependence will be superior to private markets and it is this argument that market signals will not work which enables us to place the political economy view of economic policy in context.

The political economy view does not distinguish clearly between arguing that markets do not work due to market failure and that markets do not work due to the unwillingness of agents to respond to price signals for sociological or other cultural reasons. The second of these views is a return to what Hopkins terms the 'substantive' view of African economic history and for the reasons so amply given by Hopkins we believe it to be wholly without empirical basis. However, that is not to argue that the belief, allied sometimes with views that market failures are important, has not been extremely influential. We will argue in section 5.4 that the political objective has been to supplant markets by non-market mechanisms rather than to correct perceived market failure. Thus only by chance will public sector intervention correct market failure and with at least equal probability will create it. We will also argue that by not being clear on which forms of market failure were important the public sector intervention not only prevented markets that would have worked from being allowed to do so but also failed to correct actual market failure. It is this combination of policies which we will argue has been fatal for Ghana's economic growth.

In this section we have noted that there are two approaches to the analysis of public sector policy, the first concerned with the failure of competitive markets, the second focusing on the conditions characterising a second best optimum. Although this second approach has become increasingly influential in the theory of current policy analysis it has not been of major importance in past policy prescription. We have argued that development economics has not developed a distinct theory of public sector policy but, using the first of the approaches, has identified certain market failures as of crucial importance. The most important of the market failures have been in labour, trade and investment markets.

At a rather general level it could be argued that the development of public policy analysis in both developed and poor countries was parallel with both being concerned to introduce and analyse the implications of price rigidities and imperfections arising from the failure of the competitive market model. We would argue that many of the policy differences between neo-classical economists and their opponents focus essentially on a disagreement as to whether price rigidities are inherent in monetary (or poor) economies or induced by public section actions. The same distinction has been made by Little (1982) who views the belief in price rigidities as the core element in structuralist theories. However, this disagreement is empirical, not theoretical. Thus there are NOT two theories, one neoclassical, the other structuralist-Marxist, but one theory, namely of markets, with different empirical views of elasticities. There is no dispute that markets <u>can</u> fail so it is an empirical issue whether they do so, and whether such failure can account for limited growth.

## 5.3 Market Failure in Ghana's Economic History

In section 5.2 we have argued that neoclassical policy analysis has focused on market failure (either lack of competitive markets or non-convexity or the non-existence of the market) and on the conditions necessary to ensure that the public sector 'should' be efficient. The particular market failures which have been identified as of importance for Ghana are dualism in the labour market (an institutionally given technological externality), non-competitive trade markets both in the structure of import trade and in the sense that Ghana possesses some monopoly power in the world cocoa market and non-competitive saving markets, that is a socially sub-optimal level of investment. In this section we wish to examine the empirical importance of these externalities for Ghana. In section 5.3.1 we consider labour market failure, in section 5.3.2 the problem posed by Ghana's monopoly position in the cocoa market. Section 5.3.3 considers other market failures.

### 5.3.1 Labour Markets

We noted in section 5.2 that labour market failure was regarded as the major cause of a socially sub-optimal level of investment in industry. However, much of the literature on the labour market in LDCs has been concerned with the problems posed by too high urban wages.[(4)] This market imperfection, insofar as it exists, is the result not of the dual economy model as envisaged by Lewis and Jorgenson but of government policy and is clearly not germane to our inquiry as to whether governments need to have intervened in labour markets. Our interest is in whether workers were paid their average or their marginal product and, equally important, if they were not how large was the subsidy which would optimally have been required. Stiglitz

(1969) has argued in the context of rural-urban migration in Africa,

> "... that the allocation of labour between the sectors depends on, among other things, the pattern of land ownership (whether owned privately or communally) and arrangements for 'sharing' among members of the community. In the African context, probably the most reasonable assumptions yielded the result that labour allocated itself so that the marginal productivity of labour in the rural sector equalled the expected urban wage (ignoring risk aversion and transportation costs). Since the common pattern in Africa is that some members of the family remain in the rural sector working the land, and some migrate temporarily to the urban sector; in deciding whether to migrate, the worker needs only to compare his marginal product in the rural sector with his expected income in the urban sector. Other circumstances were delineated where labour allocated itself so that the average productivity of labour in the rural sector equalled the expected urban wage. (In particular, this required the absence of a landless rural labouring class receiving as a wage its marginal product, and communal ownership of land, with the further stipulation that when individuals left the rural area, they no longer received any returns from the land. These assumptions are clearly not satisfied in most African countries.)"
> [Summary from Stiglitz (1974: 205 fn)]

An exactly similar theoretical argument would apply if we were to consider the two sectors as being the cocoa and the food sector except that the competitive wage available in the cocoa sector would replace the expected urban wage. However, the evidence suggests that labour did not move from one sector to the other and that specialisation, although it did occur, was limited. Why? The reason we would argue is the absence of competitive risk and capital markets. Complete specialisation might imply an inability to buy food in a poor year, a risk that would have been avoidable with adequate capital markets but without them made specialisation far too costly. Not only was complete specialisation risky but the costs of insurance were very low as food crops were complementary with expanding cocoa acreage. Thus we have here an example of the development of some aspects of an insurance market. There is, however, an aspect too of market failure (a more efficient solution would have been savings institutions which would have enabled more complete specialisation to occur) to which we will return in chapter 6.

There remains the question of whether labour was paid its marginal or average product. There appears to be no evidence for the food sector but we do have evidence for the cocoa sector to which we now turn. Beckett (1972: 11) gives the following wage rates (these are average earnings per labourer per day) and farm prices for the crop years 1936/37 to 1938/39 for a cocoa farm, Koransang,

| Year | Wage Rates (d) | Cocoa Price (£/ton) |
|---|---|---|
| 1936/37 | 12.3 | 29.9 |
| 1937/38 | 5.8 | 14.0 |
| 1938/39 | 7.5 | 14.0 |
| Average | 8.5 | 19.5 |

At Koransang 29.0 labour days per fully bearing acreage (p.13) produced on average from 1936/37 to 1938/39, 721 loads of 60 lbs (p.11) (= 43,260 lbs). Over this period bearing acreage was 66 acres (plate 111). If we assume a Cobb-Douglas production function of the same form as that of section 3.3 we have,

$$P = V.A^{0 \cdot 6} H^{0 \cdot 4}$$

$$\therefore 43{,}260 = V (66)^{0 \cdot 6} (66 \times 29 \times 7)^{0 \cdot 4}$$

$$\therefore V = 78$$

$$MP_H = 0.4 \ . \ 78 \left(\frac{A}{H}\right)^{0 \cdot 6} = 31.2 \left(\frac{1}{203}\right)^{0 \cdot 6}$$

$$= 1.29 \text{ lbs/man hour}$$

$$= 9.0 \text{ lbs/man day}$$

$$\text{Marginal revenue product/man day} = \frac{9.0 \times 19.5}{2240} = £.078 \quad 18.8d$$

The MRP is approximately twice the wage. As the average product is greater than the marginal product there is clearly no evidence that wages were above their optimal level which would be required to sustain the view that there was a socially sub-optimal level of investment. Too much clearly cannot be made of this one study, especially as no attempt was made to measure the production function for Koransang. However, Beckett notes that the wage may understate the real cost of the labourer. "The labourer is housed, and receives free some foodstuff grown on the farm" (p.11). Further,

> "... during (the) visit to the farm a deputation from the labourers met me to solicit my support in their claim for an increase in the rate paid per load. They explained that once the survey work had begun all the cocoa was counted and weighed, and that this prevented them taking 'customary pickings'. It was the custom, they said, for the labourers to scoop off a few of the beans from the drying trays each day and to sell the cocoa to itinerant buyers."
> [Beckett (1972: 12)]

As 4 lbs of cocoa would have been worth 8d, it is quite possible that the real wage closely approximated the MRP.

An altogether more representative survey of labour market wage rates is available from Rourke (1971) where "the earnings most commonly reported in the survey for annual labour was N¢ 60 and N¢ 70" (p.50) and later Rourke reports that,

> "... the 1970 survey showed that the common daily wage for casual labour was 50 new pesewas in all parts of the cocoa belt. In addition it is the practice to provide the casual labourer with cooked food during working hours. In some cases if the employer is not ready to provide the labourer with cooked food an allowance of 10 new pesewas is given as compensation."
> [Rourke (1971: 54)]

Carrying out a similar calculation to that done above for Koransang using our stylised production function for 1975 in section 3.3 we have,

$$P = 34.5\ (A)^{0\cdot 6}\ (H)^{0\cdot 4}$$

where $H/A = 200$

$$MP_H = 34.5\ .\ 0.4\ (\frac{A}{H})^{0\cdot 6}$$

$$= 0.6 \text{ lbs/man hour}$$

$$= 4.0 \text{ lbs/man day}$$

In 1970 the cocoa producer price was £122.2/ton = NC 298.2/ton (Appendix table 10 gives exchange rates). Thus MRP/man day = NC 0.5, wholly consistent with labour being paid its marginal product.

It is of course possible that despite this evidence for a well functioning labour market in the cocoa sector, there were market imperfections in the food sector. However, if this was the case (and there appears to be no empirical evidence either way) the market imperfection would apply equally to the cocoa and the urban sector. There would be no grounds for believing that there was a socially sub-optimal level of investment in industry relative to the cocoa sector, due to labour market failure.

### 5.3.2 Trade Markets

In this section we consider the policy problems posed by the lack of a competitive export market. By 1920 Ghana produced some 34.2 per cent of world cocoa (Appendix Table 14). So by the 1920s Ghana's cocoa economy had certainly ceased to be 'small'. The price elasticity of demand for Ghana's cocoa has been carefully investigated by Blomqvist and Haessel (1972) but before considering their estimates which are primarily concerned with evaluating policy in the 1960s we wish to consider this period in the context of earlier growth.

Over the period 1900 to 1929 world cocoa output increased five times, while real world prices approximately halved (Appendix Table 14). In the UK per capita income over the period grew by 0.6 per cent per annum, while that in the US grew by 1.8 per cent per annum, Friedman and Schwartz (1982). As the US in 1929 had the highest per capita consumption of cocoa and the UK one of the highest, FAO (1955), a growth rate in world income for the cocoa market of between 1.0 and 1.5 per cent per annum appears reasonable. Blomqvist and Haessel estimate a price elasticity of world demand for cocoa of -0.4 which, if true for the 1900-1929 period, would suggest a very high income elasticity in excess of 3.0.

In the period 1950-1970, over which most of the econometric estimates have been attempted, world output increased by 80 per cent (approximately half the rate of growth achieved during the 1900-1929 period) and real world prices were approximately constant. (Appendix Table 14). Over this period per capita income growth in the UK and US was approximately 1.8 per cent and 1.9 per cent per annum, Friedman and Schwartz (1982). Thus the experience of the cocoa market since 1950 has been quite different from the experience 1900-1929. Why?

Two major explanations suggest themselves. The first is that the income elasticity of demand has drastically declined in the post 1950 period. The second is that Blomqvist and Haessel's estimate of the world price elasticity is an underestimate. If the first explanation is correct, then in the period 1900-1929 a relatively price inelastic demand curve shifted rapidly to the right due to a high income elasticity, while from 1950-1970 the income elasticity had dropped. If the second explanation is correct, then a highly price elastic demand curve existed in both periods but in the 1950-1970 period high prices led to falls in consumption, rises in demand being dependent only on the income elasticity.

In this thesis we have nothing to add to the empirical estimates of the elasticities. The price elasticity given by Blomqvist and Haessel is one of the highest estimates so arguably the data support the first explanation. As is well known, the optimal policy in these circumstances is for an export tax. Blomqvist and Haessel (1972: 23) estimate Ghana's price elasticity to be between 2.0 and 3.0 (in absolute value) suggesting (if we accept 2.5 as the middle of this range) that marginal revenue was some 60 per cent of the price, suggesting an optimal tax rate of 40 per cent. In the mid 1950s exactly this tax rate was actually imposed on the cocoa farmers, Leith (1974: 13). Before 1939 the tax rate was very much lower, averaging over the period 1916 (when tax was first collected) to 1939 some 10 per cent (Appendix Table 13).

However, the analysis so far has assumed that Ghana's competitors will not increase output by the amount that Ghana's output falls. If other cocoa countries in West Africa are growing by the same mechanism as Ghana then it is an inference from our model that output will continue to expand until the price has fallen to its long run equilibrium level. In other words, Ghana will gain nothing by a restrictive policy and insofar as the long run equilibrium price in Ghana is below that of its competitors, Ghana will lose as a result of its restrictive policy, because in these circumstances Ghana can grow by increasing its market share.

We conclude that if the optimal tax argument is accepted, then growth was fastest when policy was 'worst'. A more reasonable conclusion would be that given the difficulties of forming a cartel very low or zero taxes were the most efficient policy. In any case there is no evidence that this market failure prevented growth.

### 5.3.3 Investment Markets and Externalities

In section 5.2 we noted that externalities only cause allocative problems if they do not operate through markets. In development economics pecuniary externalities have been termed linkages and the view frequently expressed that such externalities are an important source of market failure. If such linkages are considerable then the income effects may be large and as Scitovsky implicitly argued the public sector may be able to improve on private decisions. This argument is of obvious relevance for investment markets where information failure may be acute. If it is accepted that the sale of its superior information is impractical then an a priori case for government intervention can be made.

The evidence for Ghana presented by Killick (1978) and Leith (1974) however scarcely supports the view that public sector perception of investment opportunities is superior to the private sector. Both Killick and Leith describe the large investment programme undertaken by the public sector under the Nkrumah regime. "The sheer arithmetic of the investment failure of the early sixties is remarkable. Attempts to measure incremental capital:output ratios for this period result in figures which are either absurdly large or even negative" Killick (1978: 67). A calculation by Leith (1974: 84-85) shows similar results. Whatever the reasons which are fully discussed by Killick and Leith, we can clearly conclude that as a matter of empirical fact public sector investment was much less successful at generating growth than the private sector had been before 1939.

In contrast to pecuniary externalities, technological externalities, where negotiation is expensive and property rights are not well defined, although they do give rise to market failure, are regarded by Scitovsky as of marginal relevance to development economics. When discussing technological externalities Scitovsky notes that,

> "... the examples of external economies given by Meade are somewhat bucolic in nature, having to do with bees, orchards, and woods. This, however, is no accident: it is not easy to find examples from industry. Going through the many examples of external economies quoted in the literature, I found only two that fit the above definition: the case in which a firm benefits from the labour market created by the establishment of other firms and that in which several firms use a resource which is free but limited in supply. For a more detailed discussion the reader is referred to Meade's article, which will, I think, convince him of the scarcity of technological external economies."
> [Scitovsky (1954: 299)]

However, in the case of Ghana's economic history a technological externality has been of major importance. The technological externality was the advent of a disease of the cocoa trees - swollen shoot.

The impetus to cocoa research in West Africa was given by the discovery of swollen shoot in Ghana. It was soon established that swollen shoot was caused by a virus which seriously damages the cocoa plant. The virus is considered to have spread to cocoa from forest trees occurring throughout the cocoa growing areas. Once infected, a cocoa tree can provide a source of further infection, the virus being carried by an insect known as a mealybug. It appears that as the virus spreads through cocoa trees it becomes more virulent, causing rapid death of infected trees.

The devastating effects that the disease could have on a cocoa farm can be seen from Beckett's study of Koransang, Beckett (1972). Between 1939 and 1944 swollen shoot disease had killed 74 per cent of the trees in the oldest fields (1904 to 1914 plantings) and 43 per cent in the medium aged fields (1915 to 1922 plantings). Total production had dropped from about thirty tons per annum in 1926-29 to twenty tons in 1936-39 and to six tons by 1944. Although work at Tafo has shown that certain types of cocoa are more resistant than others, it remains true now as in the 1940s and 1950s that the only treatment is the cutting out of diseased plants and their hosts to prevent the spread of the virus.

The nature of the externality is clear. Diseased cocoa threatens surrounding cocoa farms, there are many producers of the externality and many consumers; the Pigou-Baumol analysis is clearly relevant. The appropriate economic policy is a tax on the producer such that the social cost would equal the private cost. The Baumol analysis also pertains as to the practical problems posed by the policy.

Thus this externality appears to be an example from Arrow's analysis of the failure of markets for the externality to exist. If owners of cocoa farms had been able to sue farmers who allowed their infected trees to infect others, then the efficiency costs of swollen shoot could have been avoided, <u>or</u> if it had paid farmers to pay others to destroy their crops. On this interpretation the market failure can be traced to an inability to exclude and lack of the necessary information to permit market transactions to be concluded.

The various attempts to control the swollen shoot virus have had important political and economic consequences for Ghana. When the swollen shoot cutting out campaign began, no compensation or grant was paid to the farmer. The programme was clearly regarded along the lines of a public health programme. There appeared to be an important public good aspect to the problem. It was useless to cut out your own diseased trees unless those on neighbouring farms were also cut out. Some 70 per cent of the decline in cocoa output from its peak in 1936/37 to its trough in 1946/47 was concentrated in the Eastern Region where most of the swollen shoot was located. The view was widespread in official circles that control of swollen shoot was vital for the future of the cocoa industry in Ghana and the early farmer resistance to cutting out was ascribed to a pernicious mixture of ignorance and the political machinations of the recently formed nationalist movement.(5)

The advent of swollen shoot thus presents an issue where economic theory suggests an economic rationale for public sector intervention. However, if our interpretation of the mechanism of growth in the cocoa sector is correct, then the market failure may be more apparent than real. If new land could always be brought under cultivation and such we have argued has always been true, then the social value of retrieving diseased cocoa land is zero. On this interpretation market institutions did not develop to internalise the externality because there was no need of them.

Whichever interpretation is accepted, the nature of the problem was not clearly appreciated by the public sector at the time. Rather than seeking to improve on market failure, the public sector increasingly sought to use the bureaucracy established to deal with swollen shoot to bring the production aspect of the industry under public sector control by distributing subsidised inputs, Nyanteng (1980). The marketing sector was already under public sector control, Bauer (1954). We will argue in the next chapter that in certain crucial respects this public sector intervention was economically required. However, in all instances the economic rationale for intervention was not understood, so that the intervention led (wholly unintentionally) to conditions where public sector control could be exercised with a clearly irrational economic objective but a wholly rational political one.

In section 5.3 we have considered the major market failures identified by critics of neoclassical economic policy. The Seers open economy model contains a non-competitive trade market. The concerns of Lewis focus on imperfect labour and investment markets. We have argued that while these imperfections were present they have not been empirically important in explaining the pattern of growth. Before turning in chapter 6 to a market failure we believe has been of importance, in the next section we return to political economy.

## 5.4 The Political Economy of Ghana's Economic Failure

If political economy is defined as the application of economic analysis to policy questions then the neoclassical analysis of policy of section 5.3 is political economy. However, as we noted in section 5.1 the term political economy has come to be associated with an approach to development economics which urges the relevance of social and political factors to economic questions. Such factors clearly may cause important market failures which we have already very fully considered for the Ghana economy. However, is Marxist analysis simply an assertion of the empirical importance of market failure?

There is no simple way of answering this question for there seems no agreement in the literature on what constitutes a Marxist analysis of economic policy making and it has been argued by Warren (1980) that whatever their internal diversity, none are consistent with Marx. However, two broad categories of views can be identified both regarding themselves as Marxist. The first views the problems of the LDCs as due to their relationship with the international economy, its two principal themes being the unequal terms of trade and the export of surplus. An analysis for Ghana explicitly using these concepts can be found in Howard (1978). We have already argued that there is no empirical basis for the view that Ghana did not grow. A prior objection to the concepts used is that they are incoherent. The concept of 'unequal' terms of trade is meaningless while exporting surplus is simply a repatriation of profits owned by foreigners.(6) Such profits are both of minor empirical importance and, without far more analysis as to the social value of the investment, give no indication as to net gain or loss from the investment. Carlson's (1981) study is an example of this approach for Ghana.

This dependency view contrasts with a second approach also regarding itself as Marxist which regards the internal class struggle as both determining control of the state and providing the basis for the failure to pursue economic policies which will enable economies to grow. This second approach uses 'mode of production' analysis by which appears to be meant that how production is organised has economic implications. Taylor (1979) argues the general relevance of this approach while Manning (1982) and Hill (1982) provide applications to West Africa although not Ghana. At this level of generality it is hard to disagree as such general assertions do not amount to a theory. However, this approach can be used to argue along the following lines.

To explain the public sector (i.e. the state) and its objectives it is necessary to understand the economic basis of the classes in society. In the simplest model capital, owned by a homogeneous group of capitalists, and labour, owned by a homogeneous group of labourers, can be viewed as the two factors producing output. The stress in this Marxist literature on the 'relations of production' is, or can be interpreted as, an insistence that factor ownership is socially defined, i.e. which people become capitalists and which people become labourers is a function of the social structure. In an industrial society the state is controlled by the capitalists who endorse a market system, 'free enterprise', which benefits the capitalists. In an agrarian society the state will be controlled by the landlord class (owning a factor, land, excluded from the simplest model) and the economic system organised for the landlord interest. This analysis leads to the theme of conflict in Marxist literature. Classes are regarded as antagonistic. Neoclassical economic analysis is regarded as failing to recognise class conflict as the level of abstraction fails to note that factors only combine in a social context which defines classes.

Thus the division between neoclassical policy analysis and political economy can be interpreted as a division between policies focused on allocation (efficiency) and those arguing the prior importance of distribution of factor ownership. However if this interpretation is accepted then the two approaches are in no way alternatives. It is not that Marxist analysis offers a different Kuhnian paradigm to explain the same phenomenon as neoclassical economics, it is that they are dealing with quite different issues. In the concern with distribution Marxist political economy inextricably links the positive question of the basis for class conflict (i.e. who ends up owning what) with the normative question of the social justice of the arrangement. Both these questions are central to understanding the political economy of Ghana's economic failure, although we only consider the positive question.

There are two market ways of altering income distribution. One is to alter the definition of factor ownership (e.g. land reform), the other is to alter the price of factors. If the former method is chosen then class conflict will be based on factor ownership (this we have argued is the Marxist view), if the second is chosen then there will be a conflict between producer and consumer interests. In this case identifying classes (as the units in conflict) with factor owners will be incorrect as all factors in an industry have an incentive to raise the price of their product relative to other products. Class conflict in this case will be based on different producing interests competing to shift relative prices in their favour.

We noted in section 4.1 that some authors had questioned whether real income growth was the objective of the public sector. Their argument was that certain nationalist objectives, for example increasing manufacturing output and publicly controlled services, took precedence over other objectives. If class conflict is based on producer interests then an implication is that the political base of the government will attempt to shift relative prices in its favour. For Ghana we would argue that the urban base of the nationalist movement sought to do just this. Policies viewed as distinctively 'nationalist', that is expanding the industrial base, restricting imports and greatly increasing the urban employed work-force, all raise the relative price of urban based to rural based activities. Lipton (1977) has argued for the general relevance of such 'urban' bias for explaining policy. However, not all governments are so exclusively based on urban interests as was Ghana's public sector as the very different policies pursued by the Ivory Coast show. The urban base for their political support explains why urban producer interests were preferred over rural. The reason why producer interests dominate consumer interests has been understood at least since Adam Smith, namely that bargaining costs between producers are low while those between producers and consumers are high. However, the dominance of urban interests does not imply that urban incomes will rise either relatively or absolutely.(7)

The policies of the Nkrumah government which have been fully documented by the studies of Killick (1978) and Leith (1974), rapid expansion of urban sector employment, heavy (and as we have argued earlier non-optimal) taxation of cocoa, tariff protection and industrialisation, while all economically irrational, are a rational political response to urban interest groups. However, such policies redistribute incomes through prices rather than reallocating factor ownership. Thus the policies have allocative consequences. The restrictive trade regime used to build industry, Leith argues, lowered both the volume of saving and the return on saving. Tariff policy combined with budget and exchange rate policy progressively divorced domestic price levels from international ones so that export growth was initially reduced and eventually made negative. As the tax base depends to a considerable extent on the trade sector the consequent contraction of the trade sector implied a falling revenue base, Mansfield (1980).

The net result has been to lower the real income of the urban sector. By 1975 real urban wages were no higher than in 1950; by 1980 they had halved (Appendix table 11). Real public sector employment expansion had halted by 1965, as had import volume growth (table 4.2).

Why are policies so detrimental to the interests of the urban sector not reversed? A full answer would take us too far afield but the political problem has two dimensions. One is that a controlled regime generates monopoly rents available to those who issue licences. Thus there ceases to be a uniform urban 'interest'. Secondly, the short run consequences of policy reform are a redistribution of income away from the urban sector. Both these factors are powerful forces for inertia in policy making.

It is in the trade regime that the consequences of policies are most apparent. Leith (1974) is primarily concerned with the quantitative aspects; however, as Kravis (1970: 858) has argued, "perhaps the most important role played by trade is one that cannot be measured by trade statistics, viz., that a relatively open market enabled the growing country to find its area of comparative advantage and to avoid the development of insulated, high cost, inefficient sectors". The consequences of inefficiency are pervasive not only in the economic sphere but in the political and social ones. The market as a means of economic organisation appears to the political mind both disorganised, uncontrollable and irrational. Its replacement by political control and patronage (called planning) is both politically imperative and intellectually appealing. The social functions of markets in small economies are at least as important as the economic ones. The actors in the market learn that the provision of services brings profits whereas an actor in a political organisation perceives that control brings profit. Thus coups and counter coups behind their ideological rhetoric are struggles for control of the profits to be made from non-market systems of control. The sources of growth are not understood and in the context of static income control of the political machine is perceived - accurately - to be the only way to wealth. Such a system is only sustainable with aid but the poverty the public sector generates motivates the aid which enables the government to maintain the poverty.

The conclusion reached by Adam Smith when discussing the land surplus economies of North America was that "the plenty and cheapness of good land are such powerful causes of prosperity that the very worst government is scarce capable of checking altogether the efficacy of their operation", Smith (1977: 68). Clearly this was not to be so for Ghana. However, why was the result of land surplus so different in West Africa from North America? Was the only reason what government did? In the next chapter we argue that it was not only what governments did, it was also the failure of governments to act appropriately in an area of market failure central to understanding Ghana's continuing poverty.

# Chapter 6. Government Policy, Technical Progress and Scarcity

I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I -
I took the one less travelled by,
And that has made all the difference.

The Road Not Taken - Robert Frost

## 6.1 Introduction

In chapter 2 before developing a formal growth model for West African economies the origin of the vent-for-surplus model in the economic history of the North American continent was noted. North American growth was a success story, West African growth in the case of Ghana was not, as chapters 3 and 4 have documented. The vent-for-surplus model explains the consequences of the discovery of natural resources cheaper to exploit than alternative sources. However, as we noted in chapter 2, the long run results of the vent-for-surplus phase depends on how the income generated is spent. If the income is invested there may well be in Caves' words an "underlying steady swell of neoclassical growth" which can continue once the rent from the resource intensive sector is exhausted.

Thus in an empirical investigation of the sources of growth in natural resource intensive economies it is important to establish how much of the income growth is due to the rental element, how much to technical knowledge and its applications (the steady swell of neoclassical growth). In an interesting empirical test of the 'staple' version of the vent-for-surplus, Chambers and Gordon (1966) have sought to measure the empirical extent of the rental income accruing during the wheat boom phase of Canada's economic growth.

Their results are considered by Caves (1971) who, while critical of many of their empirical results, nevertheless concludes that,

> "incorporation of these effects (i.e. those omitted by Chambers and Gordon) on the boom on factor supplies and the scale of production increases the portion of the income gain inputed to the boom but still does not make it the predominant source. There is no denying Chamber and Gordon's conclusion that advances in technological knowledge and its application, moving almost costlessly across national boundaries, are likely to comprise the main source of income gains for small nations."
> [Caves (1971: 418]

In contrast for Ghana chapter 3 showed negative technical progress within the cocoa sector until the 1940s and while cocoa generated income was clearly invested and other sources of growth emerged, as chapter 4 documented, it seems clear that the extent of technical progress was modest relative to capital accumulation, particularly in the cocoa sector. In this thesis we will only be concerned with technical progress within the cocoa sector. In this chapter we investigate how this lack of technical progress affected the Ghana economy and we consider the mechanism which enabled technical progress to occur in the period after 1950.

The importance of this issue is implicit in our conclusion to chapter 5. There we argued that development economics (defined as neoclassical economic analysis applied to poor countries) has identified certain market failures as of crucial importance in explaining low incomes. We showed that, as a matter of empirical fact, failures in labour, trade and investment markets were not explanations of Ghana's failure to grow. However, from 1950 onwards growth ceased. Thus we must either argue that the policy failures documented by Killick (1978) and Leith (1974) account for the failure to grow, or we must accept that our argument is incomplete. We believe that our argument is incomplete because policy before 1939, which was in its major aspects the reverse of Nkrumah's policy, did not provide the basis for sustained rises in labour productivity and therefore per capita incomes. In other words, while a reversal of Nkrumahist policies was <u>necessary</u> for growth, the evidence from Killick and Leith is indisputable on this point, it was not <u>sufficient</u>, as the pre-1939 experience indicates. We believe the sufficient cause can be found in the failure of technical progress in the economy in general but within the cocoa sector in particular.

There are three major economic problems posed by technical progress. The first is whether and how the knowledge is produced, i.e. whether it is learnt in the process of production, through trial and error, in research departments of private companies or in publicly funded research institutes. The second is how the knowledge produced is applied. At any one time there will be a range of techniques available; which of these is to be chosen? Thirdly, the process of technical advance may have systematic factor saving biases. For example, learning by doing, which takes the form of accumulated experience in running a plant, may be viewed as purely labour augmenting technical progress, while a biological innovation of a new hybrid seed may be neutral providing labour and capital requirements are the same for the old and new seeds.

David (1975) refers to the first of these problems as the <u>generation</u> of productivity raising designs and to the second as the <u>diffusion</u> of such innovations. An argument of fundamental importance in the literature on which we wish to focus is that the generation and diffusion of technical knowledge are linked with the third aspect of technical progress, namely its factor saving bias through relative factor scarcity. In the context of United States growth the argument is that advanced for very different reasons by Rothbarth (1946), Habakkuk (1962) and David (1975). David summarises the view common to all these authors that

> "America's comparative natural resource abundance (expressed in a land-labor ratio higher than that prevailing in Britain) appears as a powerful influence promoting substitutions of capital for labor - not only in industry but in agricultural production as well. The resulting choice of more mechanised, capital-intensive techniques is further seen to have led, in America, to a flow of new production methods whose bias was toward augmentation of the country's labor resources rather than its capital endowment. In the context of this view, moreover, it could be said that a high rate of innovation biased toward labor-augmentation was attributable to the comparative scarcity of labor (vis-à-vis land) that characterised the United States economy of the pre-Civil War era."
> [David (1975: 19)]

The view that factor scarcity influences the pattern of innovation has been asserted not only in comparisons of British and American nineteenth century industrial experience but also in comparisons of American and Japanese agricultural growth from 1880 to 1960. Hayami and Ruttan (1970) argue that in the United States the high land labour ratio relative to Japan made labour saving innovations particularly profitable, while for Japan relative land scarcity made land saving innovations more necessary. Hayami and Ruttan identify mechanical innovations with saving labour and biological (including chemical) innovations as saving land. They argue that "the contrasting patterns of productivity growth and factor use in U.S. and Japanese agriculture can best be understood in terms of a process of dynamic adjustment to changing relative factor prices - dynamic in the sense that production isoquants change in response to the changes in relative factor prices". [Hayami and Ruttan (1970: 1124)]

The process consisted, they argue, of rises in yield/acre in Japan while in the US land area/labourer rose, the former due to biological and chemical innovations, the latter to mechanical ones. The distinction between labour and land saving innovations has been used by Janvry (1973) to explain the failure of growth in Argentine agriculture through "the unavailability to farmers of land saving, yield-increasing technology". [Janvry (1973: 411)]

These empirical studies in the bias of technological innovation have been in part motivated by the theory of induced innovation due to Kennedy (1964) and Samuelson (1965). This theory views technical progress as proceeding uniformly across the whole range of techniques currently available. Technical progress is represented by an innovations possibility frontier. That this conceptualisation of technical progress is theoretically invalid has been argued by Atkinson and Stiglitz (1969), while the empirical possibility or usefulness of an IPF is extensively challenged by David (1975).

In David's summary of the Rothbarth-Habakkuk (R-H) thesis which we quoted above, two quite distinct arguments were being advanced. The first was that the higher relative price of labour to capital (due to abundant natural resources) led to a greater degree of capital intensity in American industry in contrast to Britain. This is Rothbarth's thesis. The argument follows from static allocation theory. It is concerned with the application of techniques not with either their production (technical progress), nor with their bias (i.e. labour or capital saving). The second argument is that relative factor prices biased technical progress to capital using, labour saving innovations, this being the view advanced by both

Habakkuk and David. This second view is concerned to explain both the production of technical knowledge and its application, and is essentially the dynamic extension of the static Rothbarth thesis. Section 6.2 considers the static argument, while section 6.3 examines the dynamic. Section 6.4 considers the empirical application of these ideas to Ghana.

Our central concern in this chapter is with why technical progress did not occur in the Ghana cocoa industry in the period to 1939 and why such progress as was achieved after 1950 was so modest. We will argue that such technical progress would have provided the basis for rising per capita incomes. However, we must note here that a central element in the argument advanced by Prebisch (1950) and Singer (1950) was that the consequences of productivity growth were asymmetrical as between technical progress in primary products and in manufactures. Thus while technological progress led to rises in real incomes in 'industrial' countries, in 'primary producing' countries it simply led to a decline in the relative price of exportable goods.(1)

We referred in chapter 1 to the model of Lewis (1969) which provides one rationale for the Prebisch-Singer argument. Lewis, it will be recalled from chapter 1, argued that effort into raising the productivity of export crops like cocoa was wholly misdirected and that technical progress needs to be concentrated in the food sector. The data from chapter 3 suggest that far from rising cocoa productivity fell over the period to 1939, while productivity in the food sector remained constant. Thus the fall in the price of cocoa must have occurred for different reasons to those advanced by Lewis. In the final section of this chapter we consider how the facts of Ghana's economic growth can be reconciled with Lewis' model, and seek to establish our conclusion that technical progress could have led to the higher incomes, thus providing a route to market oriented growth; a process which was in fact to be prevented by the nationalist policies of the post-1950 period. These are large claims and we must begin with the simplest aspect of the problem - how capital intensive will techniques be?

## 6.2 The Rothbarth-Habakkuk Thesis

The Habakkuk argument regarding the nature of American technology in contrast to British in the nineteenth century begins where Rothbarth's argument ends.

> "The only attempt to explain precisely how labour-scarcity was related to mechanisation and technical progress is that of Erwin Rothbarth. To attract labour the industrial wage had to be sufficiently high to present an effective alternative to the independent cultivation of land; and such a wage could only be paid if the American industrialist raised the productivity of labour by installing labour saving machinery."
> [Habakkuk (1962: 7)]

Habakkuk clearly recognised the problems this view faces as stated. They are most obvious if we review the implications of the standard economic theory for the two factor, two good economic model. If we have two goods, an industrial or manufacturing good and an agricultural good, both internationally traded with two countries with different labour and capital endowments, providing both countries produce both goods (and certain other assumptions are fulfilled) then the capital abundant country will export the capital intensive good, similarly the labour abundant country will export the labour intensive good, <u>but</u> factor prices in the two countries will not differ. In other words, different factor endowment does not imply differential factor prices. The theorem breaks down if both countries do not produce both goods but this would occur because the land abundant economy would abandon manufacturing to concentrate on its area of comparative advantage - agriculture. That this would occur was certainly the view of Adam Smith quoted by Habakkuk: "When an artificer has acquired a little more stock than is necessary for carrying on his own business in supplying the neighbouring country, he does not, in North America, attempt to establish with it a manufacture for more distant sale, but employs it in the improvement and purchase of 'uncultivated land'." It is also what occurred in West Africa until the tariff protection of the 1950s.

A second problem with the thesis arises if it is recognised that capital goods are themselves produced with labour. As Habakkuk notes, "if it paid American entrepreneurs to replace expensive American labour by machines made by expensive American labour, why did it not pay English entrepreneurs to replace the cheaper English labour by machines made with that cheaper labour?" [Habakkuk (1962: 8)].

Both these objections to the view that land abundance provides an incentive for capital intensive techniques in manufacturing industry have been taken up and elaborated by Temin (1966). "In fact it is a general proposition that if labour is used to build machines, then in two economies with the same interest rate machines will have the same price relative to wages (still assuming of course the same technology)" [Temin (1966: 288)]. Further, "in two countries that used the same technology but had different interest rates, the one with the higher interest rate would use the less capital intensive processes" [Temin (1966: 290)]. As both Temin and Habakkuk are in agreement that interest rates were higher in America than in Britain in the nineteenth century, this argument implies that America should have used less capital intensive techniques than Britain.

Both the arguments advanced by Temin are directed at the static allocative aspect of the R-H thesis. It has been argued by Fogel (1967) that while Temin is correct when viewed in the context of the two commodity, two factor model nevertheless three factor models can fit the stylised facts of American factor proportion and growth. Fogel's argument and its theoretical implications have been formally set out by Jones (1971) whose model as relevant to the Rothbarth-Habakkuk argument we now present.

> "Let $X_1$ and $X_2$ denote the two commodities produced. ($X_1$ can be interpreted as the output of manufacturing goods (including machines) and $X_2$ as the output of the agricultural sector.) Sector i makes use of a factor specific to that sector $V_i$ and a factor shared with the other sector, the mobile factor $V_n$. For Temin's purposes the special assumptions made are that no land is used in manufacturing activity and no capital used in agriculture. If $a_{ij}$ represents the quantity of factor i required per unit of output of $X_j$, the basic competitive equilibrium relations can be set out as in equations (6.1) to (6.5).

| | | |
|---|---|---|
| $a_{11}X_1 = V_1$ | (6.1) | $V_1$ Capital |
| $a_{22}X_2 = V_2$ | (6.2) | $V_2$ Land |
| $a_{N1}X_1 + a_{N2}X_2 = V_N$ | (6.3) | $V_N$ Labour |
| $a_{11}R_1 + a_{N1}R_N = p_1$ | (6.4) | |
| $a_{22}R_2 + a_{N2}R_N = p_2$ | (6.5) | |

> The interest rate can be associated with the ratio between the returns to capital $R_1$ and the price of new machines $p_1$. How the 'real wage' is defined makes a considerable difference to the results; however we only consider the assumption that only agricultural goods enter into workers' consumption, so that wages $R_N$ need be deflated only by the price of agricultural goods $p_2$. With immobilities, the returns to factors $R_1$ and $R_2$ need not be equalised in the market."
> [Jones (1971: 4-5)]

> "With competition ensuring that unit costs are minimised, each $a_{ij}$ depends upon the ratio of factor prices in industry j, as shown in equation (6.6).

$$a_{ij} = a_{ij}\left(\frac{R_N}{R_j}\right) \qquad (6.6)$$

> The basis for the factor-price equalisation theorem is to be found in the competitive profit relations. Consider equations (6.4) and (6.5). If this were a model for two commodities and two perfectly mobile factors, $R_1$ and $R_2$ would be driven to equality. With the $a_{ij}$ depending upon factor prices, two relationships to determine two factor prices are given once commodity prices are known. However, if $V_1$ and $V_2$ are different factors, or specific factors, the profit conditions are insufficient to determine factor returns solely from a knowledge of commodity prices. Use must be made also of the full-employment conditions, with the information they contain as to factor endowments. Solve equations (6.1) and (6.2) for

each $X_j$ and substitute into equation (6.3) to obtain (6.3'):

$$\frac{a_{N1}}{a_{11}} V_1 + \frac{a_{N2}}{a_{22}} V_2 = V_N \qquad (6.3')$$

$$a_{11}R_1 + a_{N1}R_N = p_1 \qquad (6.4)$$

$$a_{22}R_2 + a_{N2}R_N = p_2 \qquad (6.5)$$

Since the $a_{ij}$ depend on factor prices, equations (6.4), (6.5), (6.3') provide a set of three relationships in the three factor prices and, as parameters, the two commodity prices and all the factor endowments."
[Jones (1971: 6)]

Jones uses this model to show that

"With more factors employed than commodities produced, factor endowments exercise an influence over factor returns independent of commodity prices. The relationships are simple. With commodity prices held constant an increase in the endowment of the mobile factor lowers the return to that mobile factor and raises the return to both specific factors. By contrast, an increased endowment of either specific factor raises the return to the mobile factor and lowers both $R_1$ and $R_2$."
[Jones (1971: 7-8)]

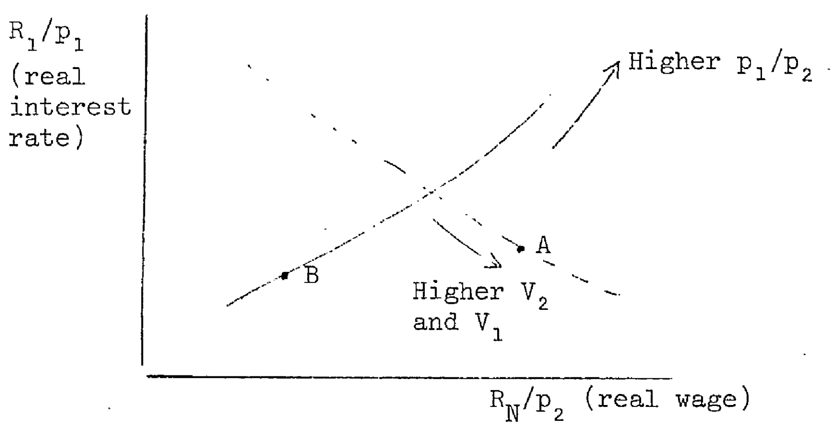



Diagram 6.1

Jones uses this analysis to consider the R-H thesis. Using diagram 6.1 (reproduced from Jones) Jones notes that,

> "... if the relative price of food was low in America and if America was land (and capital) abundant (relative to the labor endowment) compared with Britain, both the real wage and the rate of interest in America (say at A) could have been higher than in Britain (say at B). These stylised facts are consistent, in this model, with both countries having available the same basic technology."
> [Jones (1971: 14)]

Let us now consider the implications of this model for a comparison of twentieth century Ghana and Britain. Given product prices the relative land abundance of Ghana and capital scarcity could have led to a higher real wage, a higher rate of interest and lower land rents than in Britain.

Thus Jones' model provides us with one means of rationalising the factor price configurations of nineteenth century America and Britain and twentieth century Ghana assuming a similar technology.(2) However, is the explanation consistent with other facts? A prominent feature of Ghana's growth pattern was the heavy specialisation in a crop - cocoa - which was not produced at all by Britain. Thus the a priori basis for expecting the factor price equalisation theorem to hold as in the two product, two factor model breaks down. While resources remain surplus such complete specialisation must occur. The implication drawn by Adam Smith, to which we have already referred, is that for the land abundant country complete specialisation in agriculture would occur. It might be argued that a rationale along these lines leaves American industrialisation unexplained. However, much of this industrialisation occurred behind tariffs(3) which should not have been necessary if an explanation along the lines of Jones' model is to be used. As David (1975) points out, it is the dynamic aspects of capital investment that Habakkuk is primarily interested in, rationalisation of the stylised facts in three factor, two product models may not be helpful.

## 6.3 The Economics of Technical Progress

In section 6.2 we considered the static aspect of the Rothbarth-Habakkuk thesis. It is clearly possible using Jones' model to justify the view that factor proportions can influence factor prices and therefore techniques. We noted that Jones' model could explain the factor price configuration of Britain and Ghana, and that of the United States and Britain. However, we suggested that in the former complete specialisation violated the assumptions of the theorem, while even for a comparison of the US and Britain in the nineteenth century the model explains too much as American industry required protection, which of course it should not have done if Jones' model explains the facts of relative prices. The evidence, particularly for Britain and Ghana, is consistent with the factor price equalisation theorem failing to hold due to complete specialisation. With Ghana only producing cocoa and Britain only producing manufactures the basis for the theorem disappears. This, we also noted, is consistent with Adam Smith's views. While such specialisation explains the factor price configuration and thus may help explain our second question of the choice of techniques, it clearly throws no light on the first - how knowledge is produced - or the third - what factor saving biases were built into the innovations? To these two questions we turn in this section.

We can begin our discussion of this third question by quoting David's summary of Habakkuk's argument:

> "Whereas the question of the rate of investment and the expansion of manufacturing is quite irrelevant to the static mechanism envisaged from Hamilton and Gallatin to Rothbarth, it is vital to Habakkuk's account of the connection between land abundance and the comparative dearness of labour (vis-à-vis capital) in industrial pursuits ... however, Habakkuk's discussion focuses attention almost wholly upon the demand side of the industrial labor market.
>
> It was in just this connection that it appeared necessary to explain why in America the comparative absence of a reserve army of industrial labor did not so depress the profit rate as to have curtailed expansion (capital-widening) of that sector, thereby removing the upward pressure on the level of real wages which is said to have underlaid the widespread adoption of capital-intensive techniques. And here, Habakkuk maintained, the response of invention and innovation to the latent and manifest conditions of labour scarcity had to be reckoned with, entering the argument through the favourable bearing they would have exerted upon the profitability of continued industrial investment."
> [David (1975: 30)]

David (1975) seeks to formalise Habakkuk's argument using the theory of induced innovation due to Kennedy (1964) and Samuelson (1965). This theory begins by assuming the existence of a stable innovations possibility frontier, a concept clearly intended to parallel the production possibility frontier of static theory.

> "Suppose we have a neoclassical production function in two factors subject to technical change. Its general form will be $F(V_1, V_2, t)$. A special ('factor-augmenting') form will be $F[V_1/\lambda_1(t), V_2/\lambda_2(t)]$, where a decrease in $\lambda_i$ means a saving of the amount of the $V_i$ factor needed to produce any given output. (Think of $V_1$ as 'labor' and $V_2$ as 'capital'.)
>
> Presumably a limited amount of resources available for research and development can be used to get a larger decrease in $\lambda_1(t)$ only at the expense of a slower decrease in $\lambda_2(t)$. Thus, we might experiment with the hypothesis that the rates of improvement,
>
> $$-\frac{1}{\lambda_i}\left(\frac{d\lambda i}{dt}\right) = q_i$$
>
> are related by a transformation function with the usual convexity properties of a production possibility frontier."
> [Samuelson (1965: 343)]

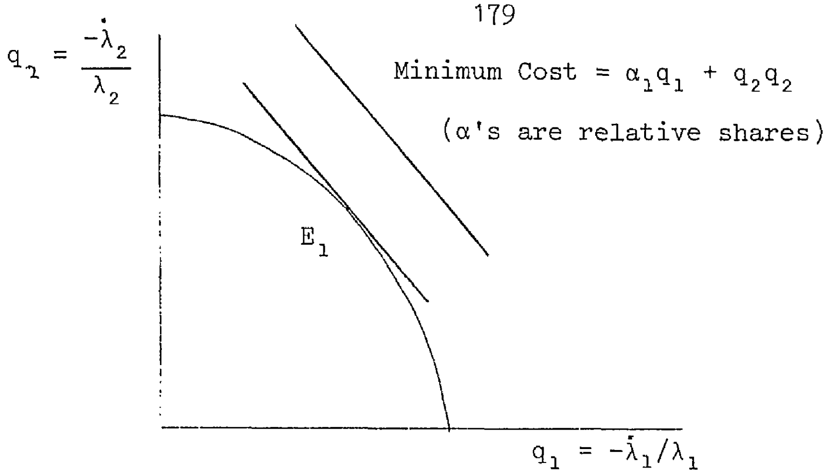



Diagram 6.2

The notion of the IPF does not deal with the problem of the production of knowledge and concentrates on the factor saving bias of its application. Kennedy (1964) sought to argue that innovations will be biased to saving the relatively scarce factor as that factor will represent a greater proportion of total costs.

In the diagram equilibrium is at $E_1$ where the minimum cost is tangential to the IPC. The problem discussed by Samuelson is that this is only the short run equilibrium position;in the long run technical progress itself will alter relative shares. David summarises the part of Samuelson's argument relevant for Habakkuk's thesis:

> "Starting with the secular tendency for capital to accumulate at a rate more rapid than that at which the labor force was growing, there would be (as Hicks observed) an incipient tendency for the wage-rental price ratio to rise. Given that the elasticity of substitution ($\sigma$) was less than unity, $\Theta_L$, the share of the factor that was tending to become less abundant should have tended to rise. But, by the mechanism Kennedy and Weizsäcker envisage, this rise would raise B (the bias of innovation), increasing the relative labor-saving bias of induced innovation. At some point the faster rate of labor-efficiency improvement relative to capital-efficiency improvement would become sufficient to offset the incipient effect upon factor-shares of the rise of the aggregate capital-labor ratio. The level $\Theta_L^*$ at which the labor share is stabilised, and the equilibrium relative bias $B(\Theta_L^*)$, therefore must depend upon the magnitude of $\sigma$,

> the shape of the IPF, and the rate of capital accumulation in relation to the growth of the labour force. In the context of the foregoing comparative analysis (of Britain and America), only the last mentioned of these appears as a potential source of international divergence in the character of technological progress."
> [David (1975: 49)]

As David notes the connection with resource abundance has become rather tenuous. However, David argues against the rationalisation of technical progress along Kennedy-Samuelson lines. His first objections are empirical but the second more fundamental objections "call into question the usefulness of the neoclassical view of technological progress, and the terms in which it has led economic theorists to formulate the notion of investment in invention and innovation as a constrained optimisation problem". [David (1975: 52)]

These objections lead David to develop the approach of Atkinson and Stiglitz (1969) who point out that technical knowledge is localised and unlikely to affect all techniques at the same time. David, in arguing the irrelevance of separating factor substitution from factor saving, brings the analysis much closer to ready empirical application for innovations which save even the relatively abundant factor may be socially profitable. Also abandoning the clear cut distinction between factor substitution and saving allows us to reintroduce the problem of how knowledge is produced, for in a private enterprise system both innovations and substitutions within existing techniques will be directed by private profitability.

The problems posed by a private market for knowledge have been of major concern in the context of foreign investment by multinationals. The problem is well summarised by Johnson (1970):

"As has long been known from the economic analysis of the patent system, the production and utilization of knowledge in a private enterprise system poses an insuperable dilemma from the point of view of welfare maximisation. The dilemma arises from the fact that the creation or development of new productive knowledge requires an investment of resources which must be recompensed if there is to be an incentive for private investment in knowledge creation, but that once new knowledge has been created it has the character of a public good, in the sense that use of such knowledge by one person does not preclude use of it by another, so that optimality requires that it be made available to all potential users without charge. Ideally, therefore, the production of useful new knowledge should be financed collectively through the government and the results made available to potential users free of charge. This is the practice with respect to some sectors of the economy, most notably agriculture; but for the most part a private enterprise system relies on private enterprise for the production of commercially useful knowledge."
[Johnson (1970: 456)]

Johnson goes on to discuss the inefficiencies implied by the private provision of knowledge in multinational corporations. An equally important point arises from the factor prices that will influence both the choice of technique and the areas of innovation to which attention will be devoted. Janvry (1973: 415) provides a classification of agricultural technologies which have become available, some through private markets, some through public sector investments, these are:

"(1) mechanical - tractor, harvester, and windmill; (2) biological - hybrid seeds and cattle breeds; (3) chemical - fertilisers, insecticides and pesticides; and (4) agronomic - cultural practices and management techniques (crop rotation, permanent pastures, forage reserves, fertility tests, etc.)"

Each of these technologies has a different factor saving bias:

"Mechanical innovations raise the productivity of labor mainly through increases in land per worker ... Biological innovations are fairly neutral on labour and management requirements ... Chemical innovations aim at increasing yield. They are fundamentally land saving in permitting substitution of capital and labour for land; capital and labor deepening, however, require both more on-line and staff management per unit of land. Finally, agronomic innovations are labor and on-line-management using and land saving. Like chemicals, they are strongly yield increasing."
[Janvry (1973: 415-416)]

In analysing the difference between mechanical and biological innovations in the context of an analysis of the difference between American and Japanese productivity growth, Hayami and Ruttan (1970) utilise an identity relating yields per labourer and yields per acre.

$$\frac{Y}{L} = \frac{A}{L} \cdot \frac{Y}{A}$$

where Y = output, L = labour, A = land area.

Hayami and Ruttan (1970) identify mechanical innovations with raising (A/L) and biological innovations with raising (Y/A). The former they argue are preferred by America where labour costs are high relative to land prices, while the latter are preferred in Japan where relative labour costs are much lower. There is a problem, however, with this argument as it stands for if - as Hayami and Ruttan seem to accept - the biological innovations are independent of land-labour ratios as they too save labour, both economies would have an incentive to use them and in principle develop them. However, if labour is cheap mechanical innovations would be less profitable so the failure to raise acreage per labourer is consistent with factor pricing influencing innovation.

Further, for chemical and agronomic innovations as defined by Janvry A/L is clearly not independent of Y/A and raising yield/acre implies lowering A/L. Thus whether such innovations are socially profitable depends in part on the size of these relative effects.(4) Similarly, whether mechanical innovations are profitable will depend on relative capital costs. Hayami and Ruttan (1970: 1136) conclude by arguing that:

> "Agriculture in the United States and Japan under entirely different initial factor endowments and factor-supply conditions attained rapid growth. There is little reason that presently developing countries cannot attain the same success if they exploit the opportunities available to them. Their patterns of growth would likely be different from the United States or Japan, as their factor supply conditions are different from those two countries. Effort must be directed to create a unique pattern of growth for each developing country. An important element in this effort appears to be a system which accurately reflects the economic implications of factor endowments to producers, public institutions, and private industry."

What then were the innovations required in Ghana? The parallel we have sought to draw between nineteenth century America and twentieth century Ghana would suggest that mechanical innovations raising the land:labour ratio would be socially most profitable. However, biological innovations could also have been profitable; what innovations were developed and how they were utilised is the subject of the next section.

## 6.4 Technical Progress and Innovation in Ghana's Cocoa Sector

In section 6.3 we examined the three major economic problems posed by technical progress. Firstly whether knowledge is produced. Secondly, how the knowledge is applied; and thirdly whether there are systematic factor saving biases in the knowledge produced. In this section we wish to consider whether the theory surveyed informs our understanding of technical progress in Ghana's cocoa sector. We begin by summarising the evidence from chapter 3 of the extent of productivity change in the sector; we then consider what knowledge was produced, how the knowledge was applied and finally its factor saving bias.

The evidence in chapter 3 was most clear on the extent of land productivity (chart 3.2, page 92). This we argued had declined continuously from the industry's inception until the 1940s. In contrast, there was very little direct evidence for labour productivity. However, by assuming that land:labour ratios had not changed we were able to infer labour inputs and we argued these were consistent with the available evidence. If this evidence is accepted then it shows a continuous decline in land and labour productivity from 1900 to the 1940s. This decline was halted in the 1940s and reversed in the latter 1950s when, from 1955/60, a substantial rise in productivity occurred. Thus the second output cycle's upturn, clearly shown in chart 3.2, was due both to new plantings and higher yields. Output approximately doubled between 1954/58 (227.3 thousand tonnes) and 1961/65 (458.1 thousand tonnes), while over the same period we estimate productivity increased by 57 per cent. Thus over half the increase in output is due to a productivity gain.

We now consider the first of the problems surveyed in section 6.3, namely how the production of knowledge was organised. In section 6.3 we argued that the private production of knowledge will only be privately profitable either if the knowledge is highly specific to the enterprise or, if it is not, if competitors can be excluded from using the knowledge without payment. These conditions clearly do not pertain to the cocoa sector in Ghana, where knowledge of new varieties or agronomic practices, if they had been made available, could readily be copied by competitors. We further noted that even if the private sector did have an incentive to produce the knowledge its private provision would be socially sub-optimal. Thus public sector investment in the production of knowledge to be made available free to the industry is the first best solution to this private market failure.(5)

Thus of particular importance is the relationship between the only public source of knowledge in Ghana, the Agricultural Department, and the cocoa farmer. Green and Hymer (1966) have studied this relationship for the period until 1939. They show that from the inception of the industry until the 1920s public sector inputs of knowledge were effectively zero. The Agricultural Department had, Green and Hymer argue, strong views on the production of cocoa which were based neither on systematic agronomic knowledge nor on an understanding of relative factor scarcities. Green and Hymer argue that the views of the Department, "were reflected in their policies well into the 1950s. Four themes predominate: production techniques, disease control, the quality of cocoa, and the degree of specialization on the farms". [Green and Hymer (1966: 308)]

On the first of these Green and Hymer (1966: 308) argue that the farmer "rejected intensive cultivation because it economised on land which was plentiful and not on labour which was scarce". Disease control was effected by allowing diseased farms to lie fallow and that "in any event, the diseases, with the two exceptions of capsid and swollen shoot, proved minor and in no case did the Agriculture Department discover a cure" [Green and Hymer (1966: 309)]. There was no economic reason for producing higher quality cocoa while although "there was a genuine problem in the need for improved methods of drying and fermentation ... the Department's constructive role in this area was very limited" [Green and Hymer (1966: 312)]. Finally they argue that diversification was advocated for fear of food shortages but that such shortages did not emerge.

Thus Green and Hymer convincingly argue that until the founding of the West African Research Institute in 1937 no systematic knowledge of the cocoa industry was produced by the public sector.(6) They are, however, careful to note that the farmers "were not able to carry out scientific research or to operate disease control schemes in which social but not individual benefits exceed costs; nor were they able to regulate output in a manner consistent with maximising total receipts once the growth of demand had slackened" [Green and Hymer (1966: 318)]. These two market failures have already been discussed in chapter 5. As we stated there, the disease control programme which was launched in the 1940s was associated with the establishment of systematic research into cocoa. Thus by accident the technological externality involved in the swollen shoot disease led to public sector investment in knowledge.(7) The knowledge produced fits neatly into the classification provided by Janvry, namely biological, chemical and agronomic innovations.

We begin by considering the biological innovations. A breeding programme to improve the yield of cocoa was an early concern of the research programme at Tafo, the early history of which is given by Bonaparte (1974).

> "The breeding programme in Ghana was initiated by Posnette in 1937 with the selection of high-yielding Amelonado trees which had been yield recorded over several years on Department of Agriculture stations in Ghana. Sections were also made for Amelonado and local hybrids (Trinitario intercrosses and crosses between Amelonado and Trinitario) on local farms. These selections were established, as clones, at the Cocoa Research Institute, at Tafo.
>
> Results from progeny and clonal trials led to the selection of a few genotypes for further work. The results of these trials confirmed earlier suspicions that the genetic variability among the types available in Ghana was inadequate. In order to establish a wider genetic base for the breeding program material was introduced from Trinidad by Posnette in 1944."

The results of this are described by Glendinning, Edwards, Quartey-Papafio (1961):

> "Amazon cocoa was introduced by Posnette in 1944, and after quarantine in Accra was planted in Tafo in 1945. Its vigorous growth, early bearing and high yield soon became apparent, and its issue to farmers in Ghana commenced in 1954, as soon as its quality was known to be acceptable to the manufacturers. A fair quantity of seed was available because the Cocoa Division of the Ministry of Agriculture had commenced planting seed production plots in 1949, and as the varieties became better known to the farmers the issue reached a huge scale. Up to March 1961 about 6,650,000 pods and 6,050,000 seedlings had been received by farmers, sufficient at a conservative estimate for about 140,000 acres to have been planted; this taking no account of further plantings made by the farmer with pods from his own trees."

It is not clear how the estimate of 140,000 acres was arrived at. Green and Hymer (1966) suggest that between 750 and 1000 seedlings are required for one acre and this is consistent with the figures for trees/acre given in chapter 3. If 750 seedlings are required for one acre then the 6 million seedlings distributed up to March 1961 would have supplied some 8,000 acres. Assuming the 6,650,000 pods supplied the balance of 132,000 acres would imply that one acre required 50 pods. The total figure of 140,000 acres indicates how small a proportion of the total tree stock were the new cocoa varieties. In chapter 3 we estimated in 1961 a total acreage of 5.6 million acres, of which 1.8 million acres was non-bearing. Thus the estimate of 140,000 acres would imply that less than 10 per cent of total new investment was in the new varieties by 1961.

From the Quarterly Progress Reports of the Cocoa Division we are partially able to follow the diffusion of this innovation after 1961. During 1962 and the first half of 1963 some 775,000 more Amazon pods were issued to farmers. From mid-1963 the Quarterly Progress Report of the Cocoa Division notes that "because almost all the Extension Plots had been handed over to the owners farmers demand for Amazon pods could not be met by the unit". It appears that systematic information about the distribution of new varieties of cocoa is not available for the later 1960s, although the above comment indicates that very little diffusion would have occurred. However, from 1970 systematic information is available in Cocoa Production Division (1978). From 1970 three methods of issuing new varieties of cocoa seem to have operated in parallel. The first was the 'Plant As You Cut' scheme which was linked to the control of swollen shoot.

"Under this scheme, the Cocoa Industry Division (now Cocoa Production Division) was to undertake:-

(a) The cutting out of all visibly Swollen Shoot Virus (S.S.V.) infected trees and their contacts.

(b) Replanting all farms so cut out with the high yielding hybrid cocoa.

(c) Maintaining the replanted farm for at least three years before handing over to the owners.

(d) All these operations would be done free of charge to farmers and that the farmers would harvest and dispose of the nurse shade (plantain and cocoyam) by themselves."

[Cocoa Production Division (1978: 20)]

The second method was that the "Cocoa Production Division also selected areas and replanted large tracts of land with hybrid cocoa to serve as demonstration farms to farmers. These were the 'block plantings'." [Cocoa Production Division (1978: 20)]

The third method appears to be a continuation of the original method by which Amazon and Hybrid Cocoa Pods were issued directly to farmers. Tables 6.1 and 6.2 summarise this direct distribution from 1970. It is unclear whether and on what scale this method of distributing new cocoa varieties to farmers was maintained in the period 1964-70. Cocoa Production Division (1978: 32) notes that "as the production of the high yielding and early maturing hybrid cocoa increased the supply of the approved Amazon types to farmers was phased out and as a result by 1975 the supply of Amazon cocoa as seed for planting had been stopped". This can be seen in table 6.1 where the issue of Amazon pods is greatly reduced in 1975 and 1976. Over the period 1970-1976 the table shows that a total of 4.4 million pods were issued, a reduction on the number issued up to March 1961 and using the same conversion factor calculated above implying at least 88,000 acres.

Table 6.1 Issue of Amazon/Hybrid Cocoa Pods to Farmers by Year and by Area, Ghana 1970-76

In thousands

| Region / Year | Ashanti | | Brong Ahafo | | Eastern | | Central | | Western | | Volta | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | H | A | H | A | H | A | H | A | H | A | H | A | H |
| 1970 | 141.0 | 34.9 | 78.5 | 16.8 | 28.2 | 152.9 | 0.018 | 4.5 | - | 5.3 | 5.3 | 5.2 | 253.0 | 219.6 |
| 1971 | 144.3 | 58.9 | 50.2 | 37.2 | 36.9 | 189.1 | 13.9 | 16.5 | 9.2 | 23.6 | 7.5 | 2.3 | 262.0 | 327.6 |
| 1972 | 172.9 | 107.2 | 54.0 | 27.6 | 72.6 | 268.9 | 36.0 | 21.2 | 70.0 | 115.0 | 13.9 | 0.3 | 419.4 | 540.2 |
| 1973 | 111.9 | 81.8 | 68.1 | 26.5 | 113.4 | 94.3 | 61.8 | 14.2 | 30.2 | 73.7 | 3.1 | 1.0 | 388.5 | 291.5 |
| 1974 | 132.2 | 190.1 | 50.0 | 37.9 | 74.4 | 129.6 | 21.7 | 28.8 | 18.0 | 84.3 | 8.9 | 3.3 | 305.2 | 474.0 |
| 1975 | 53.3 | 219.1 | 10.6 | 58.3 | 22.2 | 160.7 | 0.7 | 21.0 | - | 55.0 | 4.8 | 5.1 | 91.6 | 519.2 |
| 1976 | - | 74.9 | 5.0 | 4.3 | - | 146.3 | - | 13.1 | - | 57.0 | - | 4.5 | 5.0 | 300.1 |
| Total | 755.6 | 766.8 | 316.4 | 208.6 | 347.8 | 1141.9 | 134.2 | 119.4 | 127.3 | 413.7 | 43.5 | 21.7 | 1724.8 | 2672.1 |

A : Amazon Pods; H : Hybrid Pods.

Source: Cocoa Production Division (1978) Tables III.11, III.12, III.13, III.14, III.15, III.16.

Table 6.2 provides the total issue of seedlings which between 1970 and 1976 amounted to 39.2 million, sufficient for a maximum of 52,000 acres. Thus both tables confirm how modest has been the investment in this innovation.

Table 6.2 Issue of Hybrid Cocoa Seedlings to Farmers by Region and Year, Ghana 1970-76

In thousands

| Region<br>Year | Ashanti | Brong Ahafo | Eastern | Central | Western | Volta | Total |
|---|---|---|---|---|---|---|---|
| 1970 | 206.3 | 26.5 | 1019.8 | 143.8 | 225.5 | 104.6 | 1726.5 |
| 1971 | 610.3 | 250.0 | 2532.1 | 592.8 | 340.5 | 301.0 | 4626.7 |
| 1972 | 686.8 | 214.4 | 3056.0 | 422.4 | 1242.8 | 257.6 | 5880.0 |
| 1973 | 533.7 | 168.0 | 2178.2 | 420.4 | 492.1 | 291.5 | 4083.9 |
| 1974 | 1005.5 | 367.7 | 3929.7 | 451.1 | 62.7 | 172.6 | 5989.3 |
| 1975 | 835.1 | 479.3 | 5286.5 | 571.0 | 586.3 | 197.0 | 7955.2 |
| 1976 | 1705.5 | 438.3 | 5463.7 | 531.3 | 548.9 | 262.9 | 8950.6 |
| Total | 5583.1 | 1943.1 | 23466.1 | 3132.8 | 3498.0 | 1587.2 | 39212.2 |

Source: Cocoa Production Division (1978) Tables III.19, III.20, III.21, III.22, III.23, III.24.

The next of Janvry's classification of innovations concerns applications of chemicals. In Ghana these have consisted of insecticides and fertilisers. We consider the use of insecticides first. As we noted in chapter 3, cocoa is prone to attack by capsids and young cocoa is particularly vulnerable. It was argued by Thresh (1959/60) that in the mid 1950s most of the cocoa was free of the swollen shoot virus, that eradication measures had controlled spread and that, except for the more virulent strains, virus did not limit production as much as capsids. Whatever the truth as to this assessment of the relative importance of capsids and S.S.V., experiments had apparently demonstrated the ability to control capsids by an insecticide called Gammalin '20'. An account of the diffusion of this innovation can be found in the reports of the Cocoa Industry Division.

> "In July 1958 the Division of Agriculture was instructed to make plans for the launching of a Capsid Control Scheme, to ... commence in July 1959. The objective of this scheme was to control capsid attack on approximately $2\frac{1}{4}$ million acres of farmers' cocoa by spraying annually using teams composed of Division of Agriculture staff. This would have been a direct assistance scheme and the onus for capsid control on the majority of the mature cocoa in the country would have rested with the Government. The scheme as planned was, in essence, an expansion of a scheme which was then being operated by the Division of Agriculture to spray mainly for demonstration purposes 750,000 acres of badly damaged farmers' cocoa."
> [Cocoa Industry Division (1960-61)]

This scheme was abandoned and replaced by a scheme to provide farmers with subsidised sprayers and insecticides. This scheme was launched in April 1959.

> "During the first year of working (April 1959-March 1960) nearly a quarter of a million gallons of insecticide were sold to farmers as well as some twenty thousand motorised sprayers and just under twenty thousand hand sprayers."
> [Cocoa Industry Division (1960-61)]

Figures for Gammalin '20' sales are given in Table 6.3. The early 1960s saw on average 226,000 gallons/year sprayed on the cocoa. Many authors have attributed the rise in output of cocoa mainly or wholly to this spraying campaign. These views have been strongly challenged by Leston (1974) who argues that the short term effects were probably modest and that the long term effects were harmful.

Table 6.3 Sales of Gammalin '20' in thousand gallons

| Crop Year | Ashanti | Brong Ahafo | Western | Central | Eastern | Volta | Total |
|---|---|---|---|---|---|---|---|
| 1958/59 | | | | | | | 125.0 |
| 1959/60 | | | | | | | 250.0 |
| 1960/61 | | | | | | | 202.95 |
| 1961/62 | 76.9 | 24.4 | 20.7 | 31.2 | 43.2 | 4.0 | 200.46 |
| 1962/63 | 38.0 | 40.2 | 25.6 | 43.0 | 56.8 | 7.8 | 211.48 |
| 1963/64 | 97.8 | 36.9 | 25.5 | 40.4 | 60.3 | 4.8 | 265.75 |
| 1964/65 | 37.0 | 14.0 | 9.7 | 15.3 | 22.8 | 1.8 | 100.54 |
| 1965/66 | 3.9 | 2.3 | 1.0 | 2.1 | 1.3 | 0.4 | 11.1 |
| 1966/67 | 23.6 | 13.0 | 5.9 | 14.5 | 13.6 | 1.9 | 72.5 |
| 1967/68 | 54.6 | 34.9 | 10.8 | 21.6 | 30.0 | 5.3 | 157.3 |
| 1968/69 | 70.7 | 41.8 | 17.3 | 26.1 | 28.4 | 5.5 | 190.77 |
| 1969/70 | 83.5 | 34.8 | 23.6 | 26.7 | 24.2 | 3.1 | 195.92 |
| 1970/71 | 60.8 | 31.6 | 24.1 | 26.9 | 17.2 | 3.0 | 163.62 |
| 1971/72 | 52.5 | 25.1 | 29.6 | 25.8 | 20.2 | 2.2 | 155.3 |
| 1972/73 | 60.6 | 21.4 | 24.5 | 27.4 | 25.0 | 5.0 | 163.9 |
| 1973/74 | 47.4 | 21.9 | 25.5 | 33.5 | 35.5 | 8.5 | 172.3 |
| 1974/75 | 51.0 | 42.1 | 15.8 | 29.9 | 45.5 | 6.0 | 190.4 |
| 1975/76 | 42.6 | 47.4 | 20.8 | 21.0 | 32.1 | 11.9 | 175.7 |

Source: From 1961 I - 1976 IV quarterly figures are available from Cocoa Division, Quarterly Progress Reports, Ministry of Agriculture, Accra, Ghana. These have been summed over the crop year Oct. 1 - Sept. 30.
The 1959/60 is obtained by assuming that the amount in the Financial Year April 1959-March 1960 also applied to the crop year Sept. 1959-Oct. 1960.
The 1958/59 figure is simply half this amount.
The 1960/61 figure takes $\frac{1}{4}$ x 250,000 and adds observations for 1961 I - III. Regional allocations seem only to be available from 1961/62.

Our figures in chapter 3 which show a maximum rise in land productivity of 30 per cent certainly support Leston's major contention that the long term effects were modest. The history of cocoa output in the 1970s is ambiguous as regards the influence of spraying. Spraying did decline (table 6.3 shows that the rate never returned to the level of the early 1960s) and productivity did fall. However, there is evidence of extensive resistance being built up to the insecticide so that the lower level of spraying may not be an important factor in the fall in productivity.

A recommendation regarding the application of Gammalin was accepted which implies for an annual sale of 200,000 gallons a maximum coverage of 400,000 acres. If it is accepted that the increment from using Gammalin is 400 lbs/acre a total increment of 70,000 tons is possible. Bateman (1974), using an econometric model for cocoa, concludes that effects of this magnitude are consistent with the data. Effectively such a procedure ascribes the whole of the increase in productivity to the spraying. Our earlier discussion showed how minimal had been the impact of the new cocoa varieties so such a conclusion is wholly possible. The arguments advanced by Leston suggest that such results would in any case be short lived but he appears to be in error in suggesting that greater acreage alone could account for the increased output.

Finally we consider fertiliser and the fourth aspect of technological change identified by Janvry, namely that involving 'better' agronomic methods. Both fertiliser and improved agronomic practices are in general labour using and land saving, which as we noted above may be socially profitable but is not unambiguously so as is the case with the new varieties of cocoa. Experiments at Tafo show that certain combinations of fertiliser and shade removal lead to increases in land productivity (and almost certainly labour too) of approximately ten times.[8] Table 6.4 shows the productivity available in 'best practice' cocoa technique. The term best practice is in parentheses for whether these techniques are best practice depends on the relative factor prices facing the industry. However, table 6.4 shows that over the period of the trial from 1960/61 to 1971/72 an average yield of 2467 lbs/acre was obtained on the plot with no shade and with the application of fertiliser. This compares with an average for the whole country of a standardised productivity measure of 256 lbs/acre in 1975 (table 3.8, page 82). Thus the knowledge of how productivity could be increased was clearly produced successfully by the public sector.

However, no attempts have been made to apply fertiliser on an extensive basis and no commercial use of the agronomic techniques pioneered at Tafo has been made. The official view is that effective control of swollen shoot and capsids, allied with better horticultural methods involving care and maintenance, can raise yields to 400 lbs/acre without fertiliser.[9] It is argued that as this is approximately double the national average, further application of fertiliser would be premature.

Table 6.4 Productivity in 'Best Practice' Cocoa Technique

Mean Yield for the Amelonado Shade and Fertiliser Experiment K1 (lbs dry cocoa per acre) and the percentage increase in yield following shade removal and addition of fertiliser

| | Average 1960/61 - 1971/72 |
|---|---|
| Shade and no fertiliser | 861 |
| Shade with fertiliser | 1357 |
| No shade, no fertiliser | 1510 |
| No shade, fertiliser | 2467 |
| Shade Removal Effect | |
| (a) With fertiliser | 98 |
| (b) Without fertiliser | 84 |
| Fertiliser Effect | |
| (a) With shade | 61 |
| (b) Without shade | 72 |
| Combined Shade Removal and Fertiliser Effects | 202 |

Source: Table 116, page 211, Cocoa Research Institute, Annual Report, 1971-72, 1973.

However, this is not a valid inference for the technology pioneered at Tafo would not be applicable to small scale farming for whom the increased yields do not compensate for increased labour inputs (if they did farmers would adopt them). The capital intensive nature of the technology ensures that a lowering of capital costs was probably a necessary preliminary for its profitability (either private or social). Given the costs of administering capital to small farms the techniques would have become attractive only to large farms.[10] A 'dual' market would have developed involving <u>no</u> market imperfections with lower capital costs and higher wage costs in the large farm sector. Here arguably lies 'the road not taken' by the Ghanaian economy - rising productivity allied with rising real wages in a rapidly growing agricultural sector exploiting relative land abundance to realise growth through export markets. Falling cocoa prices may eventually have switched investments to other agricultural products, even to certain manufactures.[11] Indeed, the economic basis for industrialisation quite possibly should have been, in parallel with the American nineteenth century experience, making machines to solve the specific problems of West African agriculture.

In fact mechanical innovations have been almost entirely absent. Drawing upon American experience, however, suggests the reason. David (1975) argues that technical knowledge flowed from the particular problems faced by the American entrepreneur. An example is the combine harvester which David argues solved the labour problems facing the American farmer and was uniquely well adapted to the American agricultural landscape. Technical knowledge within the industrial sector occurred, at least in the textile industry, through learning by doing and such 'learning' provides a possible rationalisation of the tariff protection provided to industry. David argues cogently that not only was such a policy second-best but a preferable policy would have been publicly run 'pilot' plants. Exactly this sort of investment in knowledge occurred in the agricultural sector in Ghana after 1938. The parallel drawn with America suggests that it was the absence of a market for technical mechanical knowledge which would have been built into the machines which is a fundamental reason why such mechanical innovations did not emerge.

To avoid obvious misunderstanding of our argument we should make clear that we are not arguing that such a market would necessarily have produced profitable inventions, nor are we arguing that such inventions alone would have been enough. Lower capital costs, larger farms, more agronomic knowledge all were complementary inputs. Our argument is that unless the economic problem posed by the lack of private incentive to produce a public good is understood (and solved) then there is no chance, in principle, of the innovations being forthcoming.

We should also possibly anticipate a contrary argument to the effect that mechanisation has been attempted and has failed to produce satisfactory economic results. Two obvious examples are the attempt at mechanisation on the state food farms in Ghana during the Nkrumah period which have been analysed by Killick (1978), Due (1969) and Miracle (1970) and the attempts at mechanised rice farming in Northern Ghana discussed by Goody (1980). All these schemes involved public sector controlled mechanised investment. It is of course an implication of our argument that the public sector should not subsidise machines but the knowledge in making or using them. If having corrected this market failure the scheme is profitable then the market will carry it out. The scarcely credible inefficiency of public sector mechanised investment documented by Killick and Due may have discredited such investments but that innovations which raise the land:labour ratio are a central element in a successful growth path for Ghana is, we would argue, quite unaffected by such failures.

## 6.5 Terms of Trade and Technical Progress

In earlier sections we have sought to show why technical progress in the cocoa sector has not occurred in the period to 1939. We have argued that productivity increases required success in establishing a market for technical knowledge. However, we must now consider an argument influential in the development literature and referred to in chapter 1, that technical progress in the export of primary products does not lead to real income gains for the exporting country.

The asymmetry between technical progress in primary products and manufactures was a central element of the Prebisch (1950) and Singer (1950) argument that while technological progress led to rises in real income in 'industrial' countries, it led to a decline in the relative price of exportable products in 'primary producing' countries. As Findlay (1981) notes in justifying this view, "the argument becomes most ad hoc and obscure, with an odd mixture of considerations regarding monopolies, trade-unions, business cycles and price rigidities" Findlay (1981: 430). We referred in the introduction to the model of Lewis (1969) which seeks to provide a more coherent rationale for this result. Findlay (1981) has reformulated this model, which we now consider, for it is obviously central to our argument that the Prebisch-Singer thesis is incorrect.

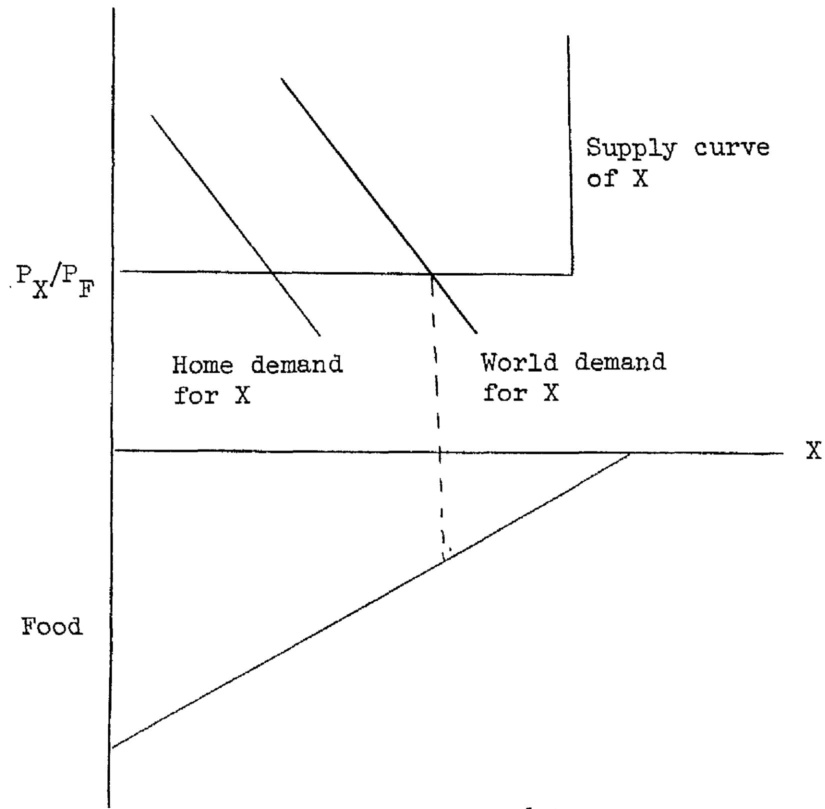



Diagram 6.3

Diagram 6.3 is taken from Findlay (1981). We are considering a two country world. "The North produces two goods, which Lewis calls steel and food, and the South also produces two goods, coffee and food, whilst each region consumes all three goods" Findlay (1981: 430). "Letting X stand for either steel or coffee diagram 6.3 shows the supply of X is perfectly elastic at the price ratio determined by the slope of the corresponding transformation curve up to the point of maximum feasible production, after which it becomes perfectly inelastic" Findlay (1981: 431).

> "Lewis observes that the historical pattern of productivity improvement has been for it to increase faster in agriculture than in manufacturing in the developed regions of the temperate zone while the tropics are marked by some technical progress in exportable primary products but more or less complete technical stagnation in the production of subsistence crops. In the stylised model this means that the cost of a unit of food in terms of steel is falling in the North while it is rising in terms of coffee in the South. Thus more and more coffee exchanges for less and less steel as a result of the 'food theory of value' the logic of which is inexorable, given the assumptions. It is difficult to conceive of a more elegant and economical theory from which to derive the implication of an adverse secular trend in the terms of trade in the developing countries."
> [Findlay (1981: 433)]

Let us rephrase this in terms of diagram 6.3. Technical progress is concentrated in the X industry for the south, the price of X relative to F falls, the supply curve shifts down by the extent of the productivity gain. The Lewis conclusion quoted in chapter 1 follows immediately as if productivity gains had been concentrated in the food sector $P_X/P_F$ would have risen.

However, as we have sought to document in chapter 3, productivity in the cocoa industry over the period to the 1940s has <u>fallen</u>, not risen. Thus the implication of this Lewis model is that $P_X/P_F$ will rise. While given the stylised nature of the model a direct test is not available, chart 1.1 (page 16) shows that the relative price of cocoa to manufactures has risen in the post-war period entirely consistent with this Lewis model. It cannot, however, be inferred that if technical progress had occurred real income would be lower. The reasons for this are well understood.

Findlay (1981) points out that if the exported good is consumed the country can still gain. Lal (1983) points out the crucial nature of the assumption of an infinitely elastic supply of labour at a constant real wage. However, even if the good is not consumed and the elasticity of supply of labour is infinite, something else must be preventing 'steel' being produced in the 'South'. We would argue in the case of Ghanaian cocoa that 'steel' was not produced as the real wage was too high relative to other poor countries but that as Ghana was not the sole exporter of the primary product its share could rise generating increased incomes through capital accumulation, despite falling single and double factoral terms of trade.

We now develop the final element of the argument of this chapter. If productivity growth could have been achieved in the cocoa sector real income growth which did occur would have been possible with real wage growth which did not. With real wage growth the incentive to substitute capital for labour, already present due to natural resource abundance, would have led to more capital intensive farming techniques. Through pecuniary externalities in the training effects of industrial products the more capital intensive techniques would generate profitable investment opportunities. The general increase in technical knowledge would lead to applications in other areas of natural resource using sectors such as timber, food processing, cattle, etc. (The parallel with the Ivory Coast will be apparent, as will the parallel with North America.) The comparison with North America with which we began this chapter and which we introduced in chapter 1 is wholly pertinent. The growth paths have the same origin; it is in the different paths taken in the markets for technical knowledge that in the words of Robert Frost have "made all the difference".

## Chapter 7. Summary and Conclusions

> The producers of cocoa in this colony ... are natives in a most elementary state of civilisation whose sole aim as yet appears to be the attainment of a maximum amount of money with a minimum expenditure of energy.
>
> Acting Director of Agriculture 1917
> quoted by Kay (1972)

The profit maximising abilities of Ghanaians which the above quotation deplores have not been successful in generating high incomes. We began this thesis by accepting the argument advanced by Hopkins (1973) that such abilities are not new to West African economic history. Further such abilities have led to growth, as Bauer (1965) has argued vigorously for many years. "The level of income in underdeveloped countries is by definition low, but this is compatible with advance, indeed even rapid advance, if that advance has begun only comparatively recently, and has started from a very low level. This is the position in many underdeveloped countries" Bauer (1965: 26). While accepting the extent of change the limitations on the growth process have been much stressed by authors referred to in this study: Amin, Howard, Seers, Seidman. They believe that such growth as was achieved was limited in extent, unequal in incidence and, most fundamental, cannot be continued. In this thesis we have excluded the normative element of income distribution and sought to investigate whether the growth achieved was limited in extent and incapable of being sustained. Before drawing together the conclusions of our thesis we summarise our argument.

In chapter 1 we set out the arguments advanced by Hopkins (1973) as to how market principles had operated in West Africa. Both Hopkins (1973) and Doyle (1974) argue that the scarcity of labour relative to land in West Africa explains both the techniques adopted and the constraints on technological innovation. Hopkins argues that new varieties of food crop spread, although slowly - due partly to a slow rate of diffusion of technical knowledge, partly to risk aversion. He argues that,

> "Where new plants and seeds were adopted, it was not because they caught the fancy of a primitive people, but because they were seen as useful additions to the existing range of foods, being worth more than the extra cost of producing them: or alternatively because they were regarded as good substitutes, yielding a higher return for the same input than the crops they displaced. Thus maize has spread in areas formerly dominated by yams and sorghum because it gives two crops a year, both of which have fairly good yields, while cassava has become common in yam producing regions because it is easy to grow and produces food throughout the year. Yams are still the preferred food and they have greater nutritional value, but they make heavy demands on the soil and they need a great deal more labour."
> [Hopkins (1973: 31)]

After a discussion as to why Africans did not utilise the plough Hopkins concludes, "To suppose that the failure to adopt a more complex agricultural technology was a cause of underdevelopment in Africa is to put plough before ox, and invention before need"[Hopkins (1973: 37)].

New crops and the plough were the technological innovations of the pre-colonial period. Growth in the cocoa sector was to proceed until the 1940s without technological advance. How this was achieved can only be understood if the mechanism of growth in the cocoa sector is correctly understood. In chapter 1 we argued that Hopkins fails to relate his arguments concerning the factors limiting growth with the various models of growth to which he refers in the course of his study. In his chapter 2 Hopkins identifies three constraints on growth. Firstly limitations caused by small market size. Secondly high transport costs. Thirdly the inadequate level of capital for technical innovation. The models he refers to are the 'staple' theory of growth, the open economy model and the vent-for-surplus model. We considered the open economy model in chapter 1. We argued that its logic implies that the economy be 'large' relative to the market for its exports. We then outlined the argument of Findlay (1973) that if trade policy is optimal, the long run rate of growth of the economy will come to depend on the rate of growth of world demand for agricultural exports unless the rate of growth of capital when only manufacturing production occurred was greater than the rate of growth of world demand for agricultural exports. We noted that although his model was formulated in terms of an 'agricultural' good and a 'manufacturing' good the economic distinction between the two goods was in the elasticity of the demand schedule so a more general formulation would be that growth would be limited by world demand growth for the 'large' commodity unless domestic capital formation could be sufficiently great in the 'small' commodity.

In chapter 2 we argued that the 'open economy model' was the theoretical structure underlying the empirical investigations of patterns of development. The implications of the model, noted in section 2.4, following from its use of the elasticity approach to balance of payments problems was to use a short run model for long period analysis. Such use of the model would be correct only if there were no growth and Keynesian unemployed resources. In contrast, the implication of the vent-for-surplus model which is consistent with the absorption approach to the balance of payments is that with public sector and non-traded sector equilibrium there will be no balance of payments deficit. The absorption approach is not a full general equilibrium approach because it considers only flow equilibria. The monetary approach includes stocks and in the context of an open economy with no autonomous central bank (which characterises Ghana until 1957) implies that the demand for money will be met by a balance of payments surplus. As the demand for money is a positive function of income the model implies that the faster the growth of the economy, the larger the balance of payments surplus. The Seers open economy model has exactly the opposite implication.

Having outlined the characteristics of the open economy model, in chapter 2 we set out the vent-for-surplus model. We followed Caves in arguing that the Myint interpretation of Adam Smith's views on trade could be viewed as the integration of the staple model of growth developed by economic historians of the North American continent and the surplus labour model of Lewis. In section 2.3 we set out formally a version of the vent-for-surplus model. We argued that the term 'surplus' has come to mean at least three different things in the economic literature. Firstly it has meant that a resource is without social value. The mathematical equivalence of this notion is that the lagrangean multipliers in the constrained maximisation problem are set equal to zero. A second use of the term 'surplus' is that labour hours are not fully utilised. While a third use of the term 'surplus' is to refer to an excess of domestic supply over domestic demand at prices which would rule in a state of autarchy. In deriving the vent-for-surplus model we showed that labour hours were assumed surplus in the second sense of the term, while land was assumed surplus in the first sense (labourers may or may not be surplus). We argued that the third sense of the term surplus in that at some price supply exceeded demand was not useful.

The dynamic aspect of the vent-for-surplus model considers the process by which the disequilibrium implied by the exploitation of a new natural resource intensive sector is eliminated. While the price clears the final good markets there is a disequilibrium in the factor market which may last for decades. An important empirical question is how this disequilibrium is eliminated, Findlay (1970) having outlined the consequences of the disequilibrium being eliminated by surplus land being exhausted.

We have already noted the implications of the model for the trade and monetary sector. In section 2.4 we also derived the implication of the model for the measurement and interpretation of GDP. We showed that if taxes on trade are the only form of taxes, then a measure of GDP at market prices accords with Mirrlees (1969) definition of potential national income. We also noted the importance given the nature of the equilibriating mechanism in the vent-for-surplus model in distinguishing GDP from GDY. Measures of these variables were presented in chapter 4 but before that we considered in detail in chapter 3 the implications of the vent-for-surplus model in the cocoa sector.

In chapter 3 we tested three aspects of the vent-for-surplus model. The first was whether 'surplus' land existed. The second was whether the disequilibrium implied by the vent-for-surplus growth process was ended by the exhaustion of 'surplus' land. Thirdly, we investigated the view put forward by Myint that growth did not involve substantial changes in productivity within the new sector.

To test these propositions we required evidence on both outputs and factor inputs. The fact that Ghana's cocoa output is primarily an export crop has meant that output statistics have been reliable and readily available over long time-periods. Equally, the nature of the production process has meant that acreage and land and labour productivities have remained either unknown or have been roughly guessed at. Although difficult to arrive at, the very success of the Ghana cocoa industry over two long cycles of output growth makes the source of this growth important.

To obtain data on factor inputs we used evidence from numerous micro surveys and large scale macro surveys carried out as part of a programme to control swollen shoot disease. By combining these studies we inferred an aggregate production function and derived a series for land productivity over time shown in chart 3.2 (page 92). We argued that the evidence of expanding acreage up to the 1930s, combined with the evidence of a marked deceleration in the growth of output from the mid-1920s, implied a substantial fall in the level of productivity such that by the end of the 1930s the level had halved from 1900. We concluded that Myint had been too optimistic in assuming growth with constant productivity. In contrast, the second output cycle from 1947 onwards was characterised by an initial output rise of approximately 25 per cent in the period 1947-52, then a period of stagnation, followed by very rapid growth from the late 1950s to the early 1960s. Our interpretation of this post-1947 growth is that initially output could grow without sustained rises in productivity simply by utilising new land planted before 1941. However, by the mid-1950s additional output had to wait the fruition of new planting in the post-war period and from 1955/60 a major rise in productivity. Once both new plantings and higher yields were available output approximately doubled between 1954/58 (227.3 thousand tonnes) and 1961/65 (466.3 thousand tonnes). Over the same period we estimate land productivity increased by 57 per cent. Thus over half the increase in output is due to a productivity gain. This productivity gain proved short-lived and since 1963 both output and productivity have fallen. The reasons for this fall in productivity are complex but the gains from insecticides appear to have been short-lived and, given the decline in new plantings from the mid-1960s, the new cocoa higher yielding varieties have not made a significant impact on the total tree stock. As chart 3.2 (page 92) shows, not only has there been no overall rise in productivity since the 1940s, but the post-war level remaining substantially <u>below</u> the level earlier in the century.

Our other major conclusion in this chapter was that not only had surplus land existed, a fact which had been widely recognised in all discussion of Ghana's growth, but that surplus land had never been exhausted, contrary to the scheme put forward by Findlay (1970) and argued for the Ghana economy by Green (1971). We argued that Ghana's cocoa output has never been constrained by a shortage of land and that the small-scale farmer who has pioneered the growth of the cocoa sector has always preferred to expand into new areas. We noted that one of the causes for the decline in productivity may well have been this extensive growth pattern. The rationality of this process was due, we have argued, to the complementary nature of expanding cocoa acreage and growing food (specialisation being limited by imperfect insurance and capital markets) and after the 1920s to reduce the risks from swollen shoot disease.

New cocoa farms and food output were complementary as food acted as a shade crop for the cocoa seedlings. Complete specialisation was to incur a high risk which, given non-existent or highly imperfect capital markets, was costly. Further insurance costs were low as food growing was cheap. These highly imperfect capital and insurance markets made rational an extensive growth pattern which implied lower productivity as cocoa growing spread to less favourable land. The inference drawn by the public sector that the ignorant farmers required control was incorrect. The public sector intervention required was to improve the functioning of these imperfect markets. In fact their imperfections were to be compounded by the public sector. Before elaborating on this point in chapter 5 we outlined in chapter 4 the real income gains to the economy as a whole as well as to the cocoa sector.

By constructing GDP and GDY accounts for Ghana at constant 1968 prices for ten-year periods from 1891 to 1974 we were able to highlight the contrast between the period before 1939 and the period after 1950. We showed that from 1891 to 1939 GDP/capita rose by 2.0 per cent per annum, GDY by 1.6 per cent per annum. From 1950 to 1974 there was no rise in GDP/capita, while GDY/capita increased at a rate of only 0.3 per cent per annum. We showed that the implications of the open economy model were without empirical basis in Ghana. Over the period 1929-1939 exports of non-cocoa grew far faster than in the period since 1950. Export growth was throughout supply-constrained. The balance of payments were in surplus on visible account in every year between 1922 and 1939 when growth was proceeding at 1.5 per cent per annum, whereas over the period 1955 to 1965 large deficits were incurred while no per capita growth occurred.

We can thus reject the open economy model as a basis for either empirical analysis or policy prescription for the economy. In contrast, we argued that the implications of the vent-for-surplus model were wholly consistent with the evidence for the barter terms of trade over our period. From 1900/04 to 1935/39 the decline in the barter terms of trade was concentrated entirely in the cocoa sector. However, this decline in the barter terms of trade was associated with a ten-fold improvement in the income terms of trade. These being related as the comparative advantage in the cocoa sector enabled the Ghanaian economy to expand output far faster than the decline in price. In section 4.3 we considered the cocoa sector in more detail. We showed that the data were consistent with the implications of the vent-for-surplus model of chapter 2. In particular we argued that

(a) cocoa offered a substantially greater return to the farmer than alternative crops,

(b) that surplus land was available and has remained so in the course of Ghana's economic history,

(c) that both labour and capital were attracted into the new sector,

(d) that food output per capita was probably constant in the first phase of vent-for-surplus growth but fell in the second phase,

(e) that substantial income gains had accrued before the rental element in the price had been eliminated despite a falling level of productivity,

(f) that supply increased as prices fell, and finally

(g) that vent-for-surplus growth was ended by lowering the return to cocoa growing to the farmer.

This income gain occurred in the context of a decline in both the single and double factoral terms of trade for the cocoa sector, table 4.5, so higher incomes were associated with absolutely and relatively falling real wages, assuming the marginal productivity theory of wage determination. It was this falling level of productivity that we argued was a central policy question for the Ghana public sector and the rationale for such policy was given in chapter 5.

Chapter 5 began by distinguishing neoclassical policy analysis from political economy. We argued that there was no inconsistency in these two approaches. Neoclassical economics was concerned with explaining the causes of poverty and pointing to the required optimal policy choice while political economy explains why, invariably, non-optimal policy choices are made. We gave an outline of the theory of economic policy and sought to show that 'development economics' has not developed a separate theory of the public sector but has argued for the empirical importance of certain forms of market failures. The most important of these market failures were due to the assumed empirical relevance of the dual economy model and viewed labour market imperfections as central. Lewis and, Killick argues, the development economics profession generally in the 1960s, viewed the level of investment as a central variable in increasing the growth rate. The labour market failure implied by the dual economy model combined with a belief that aggregate investment was 'too low' led to the two propositions that there was a socially sub-optimal level of investment and that there was a sectoral misallocation of investment. The Seers model contained a market imperfection in the trade sector. In the development literature these market failures in trade, investment and labour markets were combined with a belief in the importance of 'linkages'. We noted that linkages was simply another name for pecuniary externalities and that these did not give rise to market failure. In contrast, technological externalities which did give rise to market failures were not regarded as of importance for development economics. In section 5.3 we examined the evidence for market failure in Ghana's economic history. We argued that there was little evidence of labour market failure. The imperfection in trade markets was not, we argued, a cause of the failure to grow. Investment market failure was concentrated in the public not the private sector. While there is no evidence that pecuniary externalities have not been successfully perceived by the private market, the role of a technological externality in Ghana's economic history has been greatly underestimated. We argued that this externality arose from swollen shoot disease and that the public sector intervention had two effects which were to greatly influence the actual and potential rate of growth of the sector. The externality led to the setting up of a publicly funded research institute which was to provide systematic technical knowledge of cocoa growing in Ghana which had previously been lacking. This result can be interpreted, in the neoclassical policy framework, as the optimal response to market failure. The second effect was that the public sector intervention led to conditions where public sector control of production could be exercised with a clearly irrational economic objective but a rational political one, this second result being explicable by political economy. This led to our discussion of the political economy of Ghana's economic failure in section 5.4.

By effecting redistributive objectives through pricing policies the allocative consequences of public sector action reduced the income of the class they were designed to raise.

While government intervention has lowered real income, it clearly does not follow that an absence of government action is sufficient to enable growth to proceed. Chapter 6 sought to answer the important counterfactual question as to the results that could have been obtained by an alternative course of action. We argued that a useful way to approach this question was by a comparison of West Africa with the economic history of the North American continent in the nineteenth century. The vent-for-surplus model had applied to both areas. We introduced the Rothbarth-Habakkuk thesis which argued that in the case of America relative natural resource abundance compared with Britain led both to a more capital intensive technology and biased the search within technical progress to capital using, labour saving, innovations. The theoretical basis of the first of these assertions cannot be found in the context of the two product, two factor general equilibrium model but the more general model due to Jones (1971) offered one possible rationalisation. This model could explain the relative factor prices of Ghana and Britain in the twentieth century. We argued, however, that the failure of the factor price equalisation theory due to complete specialisation was more consistent with the facts than the Jones model. We then considered the problems of technical progress.

We examined the three major economic problems posed by technical progress. Firstly whether knowledge is produced. Secondly how the knowledge is applied, and thirdly whether there are systematic factor saving biases in the knowledge produced. We argued that there was no private incentive to produce knowledge and no public provision of agronomic knowledge until after 1937. It was argued in the context of a comparison of the US and Japan by Hayami and Ruttan (1970) that mechanical innovations which lower unit labour costs by raising the land:labour ratio were more socially profitable in America than biological innovations which save land. This argument would suggest that Ghana would have benefited from mechanical rather than biological innovations. However, we noted that within the classification of biological innovations provided by Janvry between (a) biological, (b) chemical, and (c) agronomic the biological innovations were in principle neutral in their factor saving aspects. In contrast, chemical and agronomic innovations were labour using and land saving. Thus whether chemical and agronomic innovations were socially profitable would depend on whether the increased yields justified the cost, whereas biological innovations were unambiguously socially profitable.

The innovations produced by the public sector after 1937 were almost exclusively biological rather than mechanical. The biological innovation was of new cocoa varieties which were higher and quicker yielding. However, these have made a very limited impact on Ghana's total tree stock as they became available only shortly before net investment ceased. Insecticides for the treatment of capsids were also developed by publicly funded research and it was this innovation, we argued, that was responsible for the productivity increase which occurred in the period up to 1965. We considered the fertiliser and innovations in agronomic methods together. The most important innovation in this area was connected with experiments at Tafo which showed that certain combinations of fertiliser and shade removal led to increases in productivity of approximately ten times. These innovations were not pursued on the grounds that less capital intensive investments were to be preferred.

We argued that this was an invalid inference. Capital costs could have been lowered by allowing large farms to develop. Here arguably is 'the road not taken' by the Ghanaian economy with rising wages and falling capital costs leading to more capital intensive investment exploiting Ghana's abundant natural resources. With larger farms more mechanised techniques would have become socially profitable and the solution to the technical problems posed in this area would have provided the basis for a pattern of socially profitable industrialisation, a basis which the public sector has conspicuously failed to find to date.

Finally in section 6.5 we considered the argument of Lewis (1969) that technical progress concentrated in the export sector of a primary producer would lead to lower prices and no income gain. We accepted the converse of this statement that the failure of technical progress in Ghana's cocoa industry had led to the higher relative price of cocoa in the post-1950 period than the period before 1939. However, we argued that if technical progress had been achieved in this sector, the general increase in technical knowledge would lead to applications in other natural resource-using sectors and provide the basis for diversified exports and even industrialisation which did, and continues to, elude policy makers in Ghana.

Having summarised the major points of our argument, we now seek to bring together our most important conclusions. In discussing the traditional theory of the economic functions of the state Stigler (1975: 113) remarks that "we may tell the society to jump out of the market frying pan, but we have no basis for predicting whether it will land in the fire or a luxurious bed".

Much of the current policy analysis of LDCs has been concerned with why the destination has been more frequently the fire. In this thesis we have used the two major studies of economic policy in Ghana since independence, Leith (1974) and Killick (1978). The Leith study is a part of a wider comparative project, the studies of which are summarised and compared in Bhagwati (1978) and Krueger (1978). These comparisons have provided a wealth of evidence that the type of policies pursued by Ghana have lowered both the level and rate of growth of income. The view that domestic policies have lowered income is a prominent theme in a recent World Bank Study (1981). In arguing, very accurately, that markets, where they are allowed to work, can outperform the public sector, the corollary may be drawn that government action is not required. Such a corollary is not drawn by the studies we have cited; however, many of the arguments in the literature continue to be in terms of whether markets should or should not be allowed to work. One central conclusion of this thesis is that such arguments are not relevant to the issue of the causes of poverty. The causes of poverty lie in the limits of market opportunities available and public sector action may extend or accentuate such limitations. In Ghana's twentieth century economic history the public sector has done both. We have been concerned only peripherally with why the public sector has acted in the way it has, but we can conclude that without an analysis of why markets have failed, an understanding of the widely divergent outcome of such intervention is not possible.

We would further conclude that such understanding is hindered if the question of policy is posed in terms of 'capitalist' or 'socialist' paths of development. Hill (1963) sub-titles her study of the early cocoa farmers, 'a study in rural capitalism'. Such a description is contentious because the term 'capitalism' has come to be identified not only with profit maximising market principles but with a certain set of institutions in an industrial economy. While it is clear that during the colonial period Ghana did not become an industrial economy, it is clear from chapter 4 that it became a richer one. This higher level of income was achieved, we have argued, through markets primarily in the cocoa sector being allowed to operate. These markets were in certain important respects neither competitive nor complete but they proved adequate to provide growth. The colonial institution structure provided a framework of private property rights <u>and</u> of extensive public sector investment in infrastructure and services. Thus to refer to the growth process as 'capitalist' is to focus on markets and private property rights and to miss the public sector investment undertaken. The growth which occurred is certainly consistent with the social profitability of this investment. The areas in which the public sector intervened in the colonial era are areas where arguably private market failure is most likely. However, problems posed by market failure are invariant to the form of social organisation, as studies of socialist economies have stressed, Nove (1977) (1983).

In the post-colonial era the intervention has been less successful due, we have argued, to the political objectives of urban based nationalism being in the Ghana context inconsistent with economic efficiency. The studies which have documented the extent of Ghana's economic failure since 1961 can be interpreted as showing the efficiency consequences of distribution policies proceeding indirectly through factor and product pricing. It is thus in no way surprising that policies which have as their objective a rising of relative urban incomes in fact lower all incomes, including those of the urban sector. The appropriate conclusion we would argue is that public sector intervention may accentuate market failure, not correct it, and reduce both levels of income without any improvement in its distribution. Killick (1978) has argued that to generate growth in Ghana a reversal of present policies is required.

> "Many of the apparent conflicts between economic objectives in the sixties - growth, employment, economic independence - arose essentially out of tensions between the interest of present and future generations."
> [Killick (1978: 348)]

present and future ge
[Killick (1978: 348)]

> "There is, of course, no question of a strategy of laissez-faire. Market imperfections, social injustices and the entrepreneurial gap eliminate that as neither practicable nor desirable. What is advocated is a reduced degree of intervention, a greater willingness to let the market do what it is being prevented from doing, a concentration of the resources of the state on a 'manageable number of practical problems'. This would specifically include much less dependence on direct controls and a reduction in the degree of state participation in the productive and service sectors. More positively, it would include policies designed to improve the operation of markets and to eliminate the grosser inefficiencies created during the sixties."
> [Killick (1978: 351)]

These conclusions have been argued elsewhere in more general contexts, World Bank (1981)(1983).

The conclusion of our study is that while early colonial policies before 1939 may not have been optimal, they may be the best available. However, our positive contribution is to note that Killick's reasons for rejecting laissez-faire, "market imperfections, social injustices and the entrepreneurial gap" are either incomplete or incorrect. No coherent argument has been advanced to suggest that market growth in Ghana did not benefit the poor before 1939. The growth of the cocoa industry and the vitality of the trade sector in Ghana makes nonsense of the notion of an 'entrepreneurial gap'. However, market failure existed but its nature and extent have not been clearly understood. Without such understanding, intervention will increase income by accident as arguably it did in the early colonial period.

The nature of the intervention required to ensure that welfare increases can only be understood by use of the neoclassical analysis of economic policy set out in chapter 5. We have argued that policy has been uninfluenced by a neoclassical rationale so it is not surprising that intervention has had widely divergent outcomes. The major public sector investments in the colonial period were in railways and roads (although the monetary and fiscal systems were certainly equally important public sector elements in growth). All these investments contain either large elements of public goods or - in the case of railways - are bulky investments where market failure is likely. Thus these investments were socially beneficial in that without public provision the private market would not have supplied them.

We have also argued that exactly this rationale can be offered for public sector investment in the production of technical knowledge. In both agriculture and industry the fundamental economic problem posed by knowledge is that unless its benefits can be privately marketed then it will not be privately produced and that once available economic efficiency indicates it should be freely available as it is a pure public good. An innovation that is patented and marketed in a machine may be privately produced (but utilised to a socially sub-optimal extent). Protection of such industry may be an effective, if second best, means of subsidising such knowledge production. However, in agriculture agronomic knowledge will be very difficult to patent and very expensive to produce so private sector production of knowledge is very unlikely.

In agriculture after 1937 (although not in industry) publicly funded research into cocoa was begun. Such research proceeded largely independently of factor prices and relative scarcities and produced a range of innovations, some unambiguously socially profitable as in hybrid cocoa varieties, some ambiguously so as in fertilisers and insecticides. The diffusion of the first of these innovations required sustained investment in cocoa so that the tree stock could contain an increasing proportion of the new varieties. Insecticides and fertilisers, if made available at social prices (combined with socially priced output and free information on their use) would then have been used to a socially optimal extent through allowing markets to operate.

However, our argument in chapter 5 was that the public sector's rationale was not a concern with allocative efficiency but a redistribution of income through political control of markets. Such controls embraced output after 1939 with the setting up of what became marketing boards. The public sector provision over the period 1955-1961 of heavily subsidised insecticides (and to a lesser extent fertiliser) made private market use highly profitable <u>and</u> ensured the beginnings of public sector control of production. There was no economic rationale for the subsidies but there was a coherent political rationale.

The needs of political control conflicted increasingly with the requirements of economic efficiency so that by the mid-1960s the private market incentive to invest in cocoa had been eliminated. Thus a necessary condition for the spread of high yielding cocoa varieties was eliminated and this innovation was to make no significant impact on the total tree stock. After the mid-1960s the use of fertiliser and insecticides was also to decline. The explanation is fundamentally the same as for the failure to invest, namely that the public sector distorted market prices away from their social levels. This divorce, caused primarily by the public sector's foreign exchange policy, has accelerated since the 1960s.

We have argued that mechanical innovations could have become both privately and socially profitable if (a) market prices had been kept in line with social prices, (b) large farms lowering the costs of supplying capital to them had developed, (c) fertiliser and agronomically improved practices had been allowed to proceed, and (d) the public sector had subsidised the knowledge, not the means of application of the knowledge.

This, however, was not to be. The origins of the policies which were to fail so dramatically in the post-1950 period can be sought in the concern from the 1930s of the colonial office to increase welfare. These efforts were well intentioned but Eliot's words on one of the gifts reserved for age seem pertinent:

> "And, last, the rending pain of re-enactment
> Of all that you have done, and been; the shame
> Of motives late revealed, and the awareness
> Of things ill done and done to others' harm
> Which once you took for exercise of virtue."

Chapter 1: Footnotes

(1) Hopkins argues that,

> "there were two possible escape routes from this situation (preventing market growth). The first was through an increase in population, which would have altered the land-labour ratio, encouraged the adoption of more intensive forms of agriculture and provided a larger and more concentrated market ... The second escape route was through technical innovation, which would have increased the size of the market by reducing production costs. Technical innovation might have occurred in response to an increase in demand brought about by population growth (or by a rise in incomes among the existing population), or else to overcome shortages of supply, such as a lack of raw materials or of labour. In Africa no pressures or incentives existed on the demand side, while on the supply side the main deficiency, a shortage of labour, was dealt with by using slaves."
> [Hopkins (1973: 77)]

The first of these escape routes depends on changing the land: labour ratio. The second only partly relies on factor proportions as slavery is an institutional factor.

(2) This would be a straightforward inference from the Heckschler-Ohlin model of trade. Whether this model does explain Ghana's trade pattern is the concern of following chapters.

(3) This assertion relies on the theory of competitive markets and will be elaborated in chapter 5.

(4) The argument we are summarising here relates to the single and double factoral terms of trade rather than the commodity terms of trade considered earlier in the chapter. Empirical estimates for the cocoa sector in Ghana are given in chapter 4. The view of Lewis we are summarising has been extended in Lewis (1978).

Chapter 2: Footnotes

(1) Chenery and Syrquin (1975: 17-18) say,

> "the country's population (N) is introduced as an independent variable to allow for the effects of economies of scale and transport costs on patterns of trade and production. These effects are independent of the income level, since size and level are virtually uncorrelated. Size does, however, affect a surprising number of other development processes either directly or indirectly".

It is clear the rationalisation is not related to the elasticity of the demand curve facing the economy.

(2) This possibility is suggested by Kay (1972), who argues that various policies were adopted which were intended to divert traffic to the railways to make them financially profitable. Such policies, however, do not seem to have prevented the spread of motor transportation and no evidence is presented as to the quantitative significance of the point.

(3) Wanner (1959) documents that "in the autumn of 1857 the first manager of the Akropong agricultural station, Johannes Haas born 1832 from Sissach, Basel-Camcagne, imported from Surinam, Dutch Guiana, a parcel of cocoa seeds hitherto unknown in Ghana". However, these early experiments do not seem to have been successful.

(4) The notion that the division of labour is limited by the extent of the market has been examined in the context of the theory of the firm by Stigler (1951). Stigler notes that,

> "When Adam Smith advanced his famous theorem that the division of labour is limited by the extent of the market, he created at least a superficial dilemma. If this proposition is generally applicable, should there not be monopolies in most industries? So long as the further division of labour (by which we may understand the further specialisation of labour and machines) offers lower costs for larger outputs, entrepreneurs will gain by combining or expanding and driving out rivals. And here was the dilemma: either the division of

> labour is limited by the extent of the market, and, characteristically, industries are monopolised; or industries are characteristically competitive, and the theorem is false or of little significance."
> [Stigler (1951: 185)]

Stigler argues that neither of these choices need be made but that the operations of a firm are characterised by both decreasing and increasing return operations and that with the growth of the industry firms will be led to specialise by abandoning the operations where costs are highest.

(5) The attempt to distinguish between land and labour surplus economies is elaborated in Helleiner (1966b).

(6) Birnberg and Resnick (1975) provide comparative data for export volumes of ten 'colonial' economies. The real rate of growth of India's exports over the period 1900-1936 was 1.2 per cent per annum, as compared with Ghana's 8.6 per cent per annum (our data) and Nigeria's 5.4 per cent per annum.

(7) The non-traded (by which we obviously mean not internationally traded) nature of food in the economics of West Africa is a matter of great importance. Food is non-traded because its major starchy elements are of very low value, high volume and in some cases perishable. As incomes rise demand within food switches to such foods as rice and flour which are tradeable so the inclusion of food in the non-traded category is only true over certain income levels. However, in Ghana the income levels at which the bulk of food would be tradeable have never been reached. We elaborate on the importance of this point in chapters 4 and 5.

## Chapter 3: Footnotes

(1) Agricultural production functions and their early development primarily with American data are surveyed in Heady and Dillon (1961).

(2) For the data which follow the conversion rate between area and trees/acre will be useful:

1 acre = 4840 sq. yds = 43560 sq. ft, so
4' x 4' = 16 sq. ft = 2734 trees/acre
8' x 6' = 48 sq. ft = 911 trees/acre
8' x 8' = 64 sq. ft = 683 trees/acre.

(3) In order to ensure that the data for the 1950s could be compared with that for the 1970s it was necessary to reorganise the Tanburn data to make both sets comparable. This necessitated arranging Tanburn's blocks of land by regions as defined in 1975. This was done with the assistance of maps from the Cocoa Division, whose assistance is gratefully acknowledged.

(4) Figures for the 1970s cocoa survey were finalised by 1981. The figures in table 3.4 are taken from Cocoa Production Division (1978) and scaled up in a similar procedure to that used by Tanburn. The final estimate of 5.006 million acres under cocoa compares with a finalised survey total of 4.9 million acres. This last figure was made available to the author by the Cocoa Division.

(5) Ross and Broatch (1951) state that, "the major problem of disease control occurs within an area of 600 sq. miles of the Eastern Province, in which some 90 per cent of the diseased cocoa is located" [93]. 600 sq. miles = 384,000 acres, which for simplicity we have rounded to 400,000 acres.

(6) Ingham (1981: Table 2.2) presents data to show that over the period 1905/11 labour inputs for establishment averaged 817,000 man days/year and that by 1911 some 44,000 acres had been planted. Average cocoa output from 1915/19 was 96,600 tons, implying a productivity of approximately two tons per acre. Not only is such an assumption inconsistent with all the data presented in this thesis, but Ingham (1981: 42) quotes data for the 1950s and 1960s wholly consistent with our analysis. Ingham is clearly understating labour inputs into the cocoa industry and her criticisms of Szereszewski are incorrect.

Chapter 4: Footnotes

(1) Until 1939 the bulk of tax revenue was in the form of indirect tax revenue on imports and exports. Kay (1972: Table 24a p.348) shows that in 1939 of a total revenue of £3,734,000 some 70 per cent was from import and export duties. Over the period 1900-1939 64 per cent of total government revenue came from import and export duties. The argument of section 2.4 showed that if trade taxes were the only source of government revenue then measures of GDP at constant market prices implicitly used world prices for imports and exports.

(2) Sen has sought to discuss levels of explanations in the discussion of public sector policy and in the incidence and probability of famine. Sen (1981: 299) when discussing the South Korean 'success' story argues that,

> "what made the fruits of Korean growth spread so widely was clearly the fast expansion of employment and eventually also of real wages, which went with this growth. There can be little doubt that the labour-intensive nature of the growth was central to Korean success in poverty reduction. In understanding the Korean experience, the role of employment expansion and growing demand for labour belongs to the most <u>immediate</u> level of explanation." (My emphasis)

Our argument is that the possibility of famine was alleviated by the higher incomes made possible by cocoa expansion and its labour intensive nature suggests a close parallel to Sen's analysis of South Korean growth.

(3) The arbitrary element is due to the index number problem by which if both the composition of output is changing and its relative price, then the size of GDP and its growth rate will depend on the base year.

(4) Thus $$GDY = C + I + G + \frac{P_X}{P_M} X - M$$

The procedure adopted by Summers, Kravis, Heston (1980) (SKH) is more complex and sophisticated. SKH do not derive an income measure of GDP directly but proceed first to derive a purchasing parity exchange rate from the nominal exchange rate as in Kravis, Heston, Summers (1978). They then derive a ratio of real output of Ghana to the US which they term $r_g$. A ratio of Ghanaian income to US income is then calculated termed y. The ratio $r_g/y$ gives a ratio of production to income for Ghana and this ratio can then be used to derive a real income series. SKH data is only available for Ghana from 1950-1977. Following their procedure a real income series was derived which showed practically the same growth rate as real output over the period. Our rather cruder method yields a very similar result (table 4.2).

(5) This statement of course oversimplifies a complex problem. The 'correct' price index is defined only in the context of compensating and equivalent measures of welfare change.

(6) From section 2.4 we have,

$$E = Y = P_C.C + P_I\, I + P_G.G^D + P_X\, X - P_H\, H$$

or $$\frac{Y}{P_H} = \frac{P_C}{P_H} . C + \frac{P_I}{P_H} . I + \frac{P_G}{P_H} . G^D + \frac{P_X}{P_H} - H$$

using imports as the numeraire good.

If $P_X^D/P_H^D$ rises the income gain will accrue to domestic income and expenditure. This is a pure (or costless) gain as it arises from exogenous terms of trade changes. If the income gain is all spent on consumption that is the total gain. However, if some of the income is invested then further increments in income are possible.

If $X.P_X/P_H$ rises - the income terms of trade discussed in the text - this is only a net gain if inputs are costless. Such is clearly not the case but the vent-for-surplus model argues that costs are very low. As such costs while low are clearly positive it might be thought that the income gain in table 4.1 is then a maximum amount. This is not so for two reasons. Firstly some income was clearly invested and we have made no allowance for this. Secondly our price index gives a very conservative estimate of the income gain for reasons explained in the text. For these reasons we believe our estimate of the real income gain to be a conservatively low one.

(7) The Gold Coast Blue Books from 1920 give volume import figures on a consistent basis. Import figures in tons for three major items of food imports were :

| | 1916 | 1939 |
|---|---|---|
| Flour | 3,468 | 9,754 |
| Rice | 5,333 | 10,367 |
| Sugar | 1,542 | 6,853 |

These volume figures are clearly so low as to suggest only a tiny fraction of total food supply was met by imports. Not only were these volume levels low but the proportion of food in total imports, at least early in the century, was also low.

In 1911, of a total import bill of £3,784,260, 19 per cent was taken up by food, drink and tobacco. As at least 40 per cent of this category was drink and tobacco the figures suggest only about 10 per cent of imports by value went to food. [Gold Coast Blue Book (1911)]

(8) Agricultural output figures at 1968 prices are only available from 1965. The Economic Survey (various issues) gives the following figures for the output of crops other than cocoa in NC million, 1968 prices.

| 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|---|---|---|---|
| 303 | 358 | 385 | 409 | 424 | 466 | 490 | 503 | 546 | 603 |

These figures are very unreliable. More reliable are the figures for relative food prices which suggest a fall in supply relative to demand from the 1960s.

(9) Complementarity of food and cocoa output was referred to in chapter 3. Food crops are grown as shade crops for newly planted cocoa. Thus expanding cocoa acreage and growing food crops are complementary activities while harvesting cocoa and food crops are substitutes in terms of land but not necessarily in terms of labour.

(10) This conclusion appears to conflict with other work in this area. Gunnarsson (1978: 90-91) concludes his examination of income and terms of trade to the cocoa sector:

> "The first period running from the introduction of cocoa in the Gold Coast around 1890, until the outbreak of the First World War was a period of rapid expansion for the cocoa industry with rising income for the producers. We have, therefore, little reason to doubt the findings made by other researchers who have stated that major structural changes of the economy took place during this period. The improvements of the income terms of trade were caused by increasing export volumes which counterbalanced the effects of the decreasing export prices in relation to import prices. A second period began in 1915 and continued until 1921. This was a period of deterioration mainly due to the effects of the First World War. During the war the net barter terms of trade declined and since the expansion of export volume was somewhat halted, income terms of trade also declined. This period was the first serious setback to the industry and some of the difficulties became apparent later. A third period, 1922-1927 was a time of recovery, with respect to farmers incomes. Improved prices together with expansion of production, brought increasing real incomes. The fourth period from 1928 to 1943, with a minor

> upswing 1933-1937, was the period of severe decline for the Gold Coast cocoa industry. Although there was a rapid increase of production the effects of the decreasing price ratio could not be balanced."

In 1921 our figures (appendix tables 1 and 4) show real income (at 1968 prices) of NC 12 million, while in 1915 the number was NC 18.5 million. However, 1921 was a wholly exceptional year. Table 4.4 shows that on average 1920/24 experienced real income 30 per cent above 1915/19. Table 4.4 also shows that while income fell in the 1930s below the level it had reached in 1925/29 even in the 1930/34 period it was over 50 per cent above the 1915/19 level. Gunnarsson has been led to exaggerate the decline in Ghana's cocoa producers income by accepting the FAO (1955) producer prices for the period 1900-1918. These prices are consistently above fob export prices which implies firms were exporting at a loss. This seems extremely improbable. As explained in appendix table 4, we have adjusted producer prices downwards for the period 1900-1918.

(11) Prais et al (1981: 5-6) show that in a comparison of manufacturing production per head between West Germany and Britain, while in 1950 West Germany's productivity was 39 per cent below that of Britain, by 1978 German manufacturing output per employee was about 33 per cent ahead of that of Britain. Thus Germany's productivity growth rate was over twice that of Britain. However, while Britain's performance was poor relative to West Germany, it was over the same period similar to that of America so the comparison in the text between Ghana and Britain for the period after 1950 would, as far as relative growth rates are concerned, not be very different for a comparison of Ghana and America.

Chapter 5: Footnotes

(1) These views characterise development economics generally and, it has been argued, form the basis of the subject, Lal (1983).

(2) A thin line divides those who believe market signals are wrong from those who believe agents do not respond. The latter view implies the irrelevance of pricing policy. We have already make clear why we do not accept this view.

(3) The conditions under which public sector efficiency is desirable have been investigated in a large literature to which we do not refer as this approach has not exercised extensive influence on general development policy formulation.

(4) Too high in the sense that at the wage available urban supply exceeds demand. Bauer (1954) argues this was certainly the case for the 1950s.

(5) "May I remind you that this is the fourth conference of its kind which has been held in London since 1946. You will remember that the urge to hold these gatherings arose out of our realisation of the grave menace to cocoa production created by tropical diseases, and in particular of swollen shoot, and out of our belief that it would be the desire of everyone throughout the world interested either in production or consumption to assess the position and to consider what steps could be taken to remedy it, and what progress we could make towards the achievement of our long-term objective, which is that cocoa shall be a commodity which is freely bought and sold in the markets of the world."

This quote is taken from the Opening Address to the Cocoa Conference of 1949 by Mr A Whittaker, the President of the Cocoa, Chocolate and Confectionary Alliance.

Much concern was regularly expressed at these conferences at both the speed of cutting out diseased cocoa trees and the ability of the government to enforce the process, an example of the official view is:

> "At that time (1949) we were still hampered (in the fight against swollen shoot) by the aftermath of the 1948 disturbances and of the complete cessation of cutting out caused by the opposition stirred up by irresponsible political agitators. Cutting out could only proceed at the wish of each individual farmer and in certain districts it was impossible to undertake control work at all. At the same time the available field staff was limited by the decision of the legislature that no further expatriate Agricultural Survey Officers should be recruited until every effort had been made to enlist local personnel for the task. This short-sighted but quite natural manifestation of national pride put a serious brake on operations."

This comment was made by Mr S Macdonald Smith in his paper 'The Swollen Shoot Campaign in the Gold Coast' included in the Report of the Cocoa Conference 1950.

(6) Howard (1978: 21) provides the following definition of 'unequal exchange':

> "In theoretical terms, the basis of the profit extracted from the trade relationship between Europe and Ghana was unequal exchange. Unequal exchange is fundamentally a non-capitalist way to make profits ... When unequal exchange takes place, goods which are of equal value in terms of the labour power which enters into them are not exchanged for equal prices. Rather, one costs far less on the market than the other; the labour power, which is of equal use value in both situations, is remunerated unequally."

This appears to assert that real wages are lower in Ghana and activities are more labour intensive. However, even if the resulting terms of trade are described as 'unequal' the above neither explains them nor provides any coherent reason why the country would be better off without trade.

(7) It is also true that a policy which diverts labour from the rural to the urban sector may result in the terms of trade turning against the urban sector. Knight's (1972) study of rural-urban migration in Ghana and the resulting rise in relative food prices supports the view that the terms of trade did turn against urban workers.

Chapter 6: Footnotes

(1) These papers identify 'industrial' with developed and 'primary producing' with undeveloped. As was noted early in the empirical discussion of the empirical accuracy of the views of Singer and Prebisch regarding the barter terms of trade such an assumption requires qualification. Spraos (1980) summarises the evidence for the net barter terms of trade between manufactures and primary products. Our concern is exclusively with Ghana rather than these general arguments.

(2) The stylised price figuration of twentieth century Britain and Ghana would be that Ghana's real wage and real rents were lower and real capital costs higher than in Britain.

(3) A discussion of the rationale for American tariff policy fully aware of the theoretical objection to such policies is in David (1975).

(4) In other words, the social profitability of the innovation becomes a matter for empirical investigation depending on prices of factors and the extent of lowering of costs. Very little, if any, social appraisal of innovations has been carried out in Ghana, not least through a failure to recognise the economic issues involved in their assessment.

(5) A formal model in which this market failure appears is Arrow (1962). Arrow presents a model in which there are increasing returns to scale due to learning which is the product of experience. Experience being modelled by cumulative gross investment. Due to decreasing costs with accumulated 'experience' and the payment of factors by their marginal products the private marginal productivity of new investment is less than the social marginal productivity since the learning effect is not compensated in the market. Arrow shows that the result is a socially sub-optimal level of investment.

(6) The details of the setting up of a formal research institute for cocoa in West Africa can be found in Leston (1972).

> "The Cocoa Research Station, as it was styled officially, commenced its operations on 12 August 1937, at New Tafo ... the station was founded following the advice of Sir Frank Stockdale given to the Secretary of State for the Colonies in 1935, and the eventual site was selected by the Director of Agriculture (Gold Coast) in July, 1937 ... Work under its aegis stopped in 1942. There then followed a period of reorganisation, during which urgent work was carried on by the Department of Agriculture (Gold Coast), until the station was formally re-constituted in 1944 as the West African Cocoa Research Institute ... an Ibadan substation was opened early on. In 1961 the Institute split into the Cocoa Research Institute of Nigeria and the Cocoa Research Institute of Ghana (CRIG)."

(7) The nature and consequences of swollen shoot as a technological externality were discussed in chapter 5. We argued there that its economic importance to the farmers who could move was small. However, if they were moving to land with lower productivity this conclusion would require qualification.

(8) In chapter 3, chart 3.1 (page 72) we used data from Tafo to investigate the technical relationship between land and labour productivity on cocoa farms. For a density of 45 sq. ft/tree yield/man day was 158 lbs and yields/acre were 2038 lbs/acre. The technical knowledge required to raise productivity was clearly available.

(9) This view is of course similar to the one criticised by Green and Hymer (1966). However, the fact that the technical change is labour using does not by itself indicate its social unprofitability as we noted in footnote 4.

(10) Bottomley (1971) argues that the costs of supplying capital in rural markets to small scale producers will be high. Leith (1974) documents how public sector intervention segmented the capital market making it more imperfect.

(11) Recall the Findlay (1973) model of chapter 1. These non-cocoa agricultural products would have faced a far more price elastic demand curve than cocoa. However, even with specialisation in cocoa greatly reduced costs in Ghana may have forced competitors out of the market, thus raising Ghana's share but not reducing the cocoa price. In a manufacturing sector providing inputs to the cocoa industry the specialised knowledge required would have made competing with foreign firms possible - providing as always the market in knowledge is operative.

## Appendix Tables

## A Note on Units and Sources

This Appendix provides details of data and their sources referred to in the text.

The constant price series and the index numbers are, where possible, all based on 1968=100. The year 1968 was chosen as that is the base year for the constant price GDP figures given in chapter 4. Constant prices are either presented in £ sterling or NC (New Cedis). We refer throughout this Appendix to New Cedis. However, as noted by Killick (1978) on 19 February 1972 the appellation new was dropped. Thus the unit we use is identical to that used in the Killick (1978) study. Exchange rates are given in Appendix table 10 to facilitate conversions. Where data are quoted in different units the tables have sometimes given both units, again to facilitate comparisons.

The reliance on the data collected by Hymer and presented in Kay (1972) will be obvious, as will our debt to the Szereszewski (1965) study. Our extension of their work has consisted of extending their series and presenting them in a way that enables the major economic problems facing the Ghana economy to be seen in focus.

Appendix Table 1 Ghana's Cocoa Output, 1897-1981

(000s)

| Year | Output tons | Output tonnes | Year | Output tons | Output tonnes | Year | Output tons | Output tonnes |
|---|---|---|---|---|---|---|---|---|
| 1897 | 0.098 | 0.1 | 1926 | 230.8 | 234.5 | 1955 | 219.8 | 223.3 |
| 1898 | 0.197 | 0.2 | 1927 | 209.9 | 213.3 | 1956 | 228.8 | 232.5 |
| 1899 | 0.295 | 0.3 | 1928 | 225.1 | 228.7 | 1957 | 255.7 | 259.8 |
| 1900 | 0.492 | 0.5 | 1929 | 238.1 | 241.9 | 1958 | 206.5 | 209.8 |
| 1901 | 0.984 | 1.0 | 1930 | 190.6 | 193.6 | 1959 | 255.5 | 259.6 |
| 1902 | 2.362 | 2.4 | 1931 | 244.1 | 248.0 | 1960 | 317.1 | 322.2 |
| 1903 | 2.264 | 2.3 | 1932 | 233.8 | 237.5 | 1961 | 432.2 | 439.1 |
| 1904 | 5.118 | 5.2 | 1933 | 255.7 | 259.8 | 1962 | 408.6 | 415.1 |
| 1905 | 5.118 | 5.2 | 1934 | 220.0 | 223.5 | 1963 | 421.3 | 428.0 |
| 1906 | 8.957 | 9.1 | 1935 | 277.2 | 281.6 | 1964 | 421.0 | 427.7 |
| 1907 | 9.4 | 9.5 | 1936 | 285.0 | 289.6 | 1965 | 571.7 | 580.8 |
| 1908 | 13.0 | 13.2 | 1937 | 300.0 | 304.8 | 1966 | 409.2 | 415.7 |
| 1909 | 20.1 | 20.4 | 1938 | 232.0 | 235.7 | 1967 | 375.3 | 381.3 |
| 1910 | 22.6 | 23.0 | 1939 | 298.0 | 302.8 | 1968 | 415.0 | 421.6 |
| 1911 | 39.8 | 40.4 | 1940 | 241.7 | 245.6 | 1969 | 333.6 | 338.9 |
| 1912 | 38.7 | 39.3 | 1941 | 237.0 | 240.8 | 1970 | 411.0 | 417.6 |
| 1913 | 50.6 | 51.4 | 1942 | 250.7 | 254.7 | 1971 | 421.0 | 427.7 |
| 1914 | 52.9 | 53.7 | 1943 | 207.3 | 210.6 | 1972 | 457.3 | 464.6 |
| 1915 | 77.3 | 78.5 | 1944 | 196.1 | 199.2 | 1973 | 415.2 | 421.8 |
| 1916 | 72.1 | 73.3 | 1945 | 228.7 | 232.4 | 1974 | 365.9 | 371.8 |
| 1917 | 90.9 | 92.4 | 1946 | 209.4 | 212.8 | 1975 | 369.5 | 375.4 |
| 1918 | 66.3 | 67.4 | 1947 | 192.1 | 195.2 | 1976 | 394.1 | 400.4 |
| 1919 | 176.2 | 179.0 | 1948 | 207.6 | 210.9 | 1977 | 318.8 | 323.6 |
| 1920 | 124.8 | 126.8 | 1949 | 278.4 | 282.9 | 1978 | 267.1 | 271.4 |
| 1921 | 133.2 | 135.3 | 1950 | 247.8 | 251.8 | 1979 | 264.8 | 269.0 |
| 1922 | 159.4 | 161.9 | 1951 | 262.2 | 266.4 | 1980 | 285.4 | 290.0 |
| 1923 | 197.6 | 200.8 | 1952 | 210.7 | 214.1 | 1981 | 254.0 | 258.0 |
| 1924 | 223.2 | 226.8 | 1953 | 247.0 | 251.0 | 1982 | | |
| 1925 | 218.2 | 221.7 | 1954 | 207.7 | 211.0 | | | |

Sources: 1897-1932 FAO (1955) Output = Exports and Year is calendar year.
1933-1947 Bateman (1974: Table A1) Year is crop year.
1948-1979 See Appendix Table 2.
1980-1981 Gill and Duffus, Cocoa Market Report, No. 294, February 1981.

Appendix Table 2 Ghana's Disaggregated Cocoa Output, 1947/48-1978/79

(tons)

| Crop Season 1 Oct-30 Sept | Ashanti | Brong Ahafo | Western | Central | Eastern | Volta | Total |
|---|---|---|---|---|---|---|---|
| 1947/48 | 105,935 | | 26,530 | | 54,134 | 19,960 | 207,559 |
| 1948/49 | 125,866 | | 46,321 | | 79,707 | 26,458 | 278,352 |
| 1949/50 | 116,019 | | 40,498 | | 67,088 | 24,229 | 247,834 |
| 1950/51 | 122,667 | | 45,390 | | 69,531 | 24,635 | 262,223 |
| 1951/52 | 97,669 | | 30,703 | | 58,723 | 23,568 | 210,663 |
| 1952/53 | 118,297 | | 39,235 | | 61,541 | 27,909 | 246,982 |
| 1953/54 | 102,506 | | 35,114 | | 48,217 | 21,856 | 207,693 |
| 1954/55 | 112,063 | | 32,416 | | 53,250 | 22,071 | 219,800 |
| 1955/56 | 119,035 | | 32,152 | | 49,944 | 27,657 | 228,788 |
| 1956/57 | 124,804 | | 44,098 | | 55,013 | 31,782 | 255,697 |
| 1957/58 | 104,923 | | 36,704 | | 42,776 | 22,059 | 206,462 |
| 1958/59 | 85,130 | 69,595 | 26,993 | | 53,064 | 20,702 | 255,484 |
| 1959/60 | 105,051 | 74,346 | 52,030 | | 62,772 | 22,949 | 317,148 |
| 1960/61 | 148,122 | 96,310 | 21,300 | 49,832 | 86,067 | 30,612 | 432,243 |
| 1961/62 | 133,491 | 85,221 | 20,828 | 60,735 | 79,825 | 28,547 | 408,627 |
| 1962/63 | 133,117 | 96,247 | 22,878 | 63,820 | 84,494 | 20,721 | 421,277 |
| 1963/64 | 154,120 | 88,950 | 21,504 | 56,516 | 75,638 | 24,226 | 420,954 |
| 1964/65 | 211,744 | 130,262 | 30,943 | 67,112 | 101,000 | 30,662 | 571,722 |
| 1965/66 | 153,328 | 100,187 | 23,424 | 40,929 | 71,012 | 20,294 | 409,174 |
| 1966/67 | 127,243 | 97,966 | 24,773 | 43,165 | 63,697 | 18,392 | 375,348 |
| 1967/68 | 140,679 | 108,310 | 27,389 | 47,723 | 70,422 | 20,334 | 414,981 |
| 1968/69 | 113,084 | 87,064 | 22,016 | 38,362 | 56,609 | 16,345 | 333,580 |
| 1969/70 | 124,482 | 113,611 | 30,651 | 53,544 | 68,197 | 20,540 | 411,025 |
| 1970/71 | 130,235 | 113,274 | 35,254 | 54,825 | 71,722 | 15,647 | 420,957 |
| 1971/72 | 137,332 | 124,292 | 40,338 | 53,443 | 78,391 | 23,453 | 457,250 |
| 1972/73 | 123,669 | 110,978 | 42,238 | 43,024 | 73,452 | 21,839 | 415,200 |
| 1973/74 | 105,307 | 77,251 | 40,693 | 63,777 | 64,577 | 14,261 | 365,866 |
| 1974/75 | 110,702 | 79,897 | 46,418 | 54,804 | 64,235 | 13,452 | 369,507 |
| 1975/76 | 122,383 | 87,080 | 54,778 | 48,943 | 67,540 | 13,407 | 394,131 |
| 1976/77 | 103,234 | 78,682 | 38,883 | 38,649 | 50,413 | 8,917 | 318,778 |
| 1977/78 | 86,940 | 59,505 | 38,886 | 29,524 | 45,710 | 6,489 | 267,053 |
| 1978/79 | 86,769 | 51,267 | 46,187 | 25,832 | 49,529 | 5,249 | 264,833 |
| 1979/80 | | | | | | | |
| 1980/81 | | | | | | | |

Appendix Table 2: Sources

| | |
|---|---|
| 1947/48-1952/53 | Tenth Annual Report of the Cocoa Marketing Board for the year ended 30th September 1957. |
| 1953/54-1962/63 | Sixteenth Annual Report of the Cocoa Marketing Board for the year ended 30th September 1963. |
| 1963/64 | State Cocoa Marketing Board (C.M.B.) Newsletter May 1965 No. 29. |
| 1964/65 | Total taken from C.M.B. Newsletter No. 34 Jan. 1967, regional totals estimated by taking averages of 1963/64 and 1965/66. |
| 1965/66 | C.M.B. Newsletter No. 34 Jan. 1967. |
| 1966/67-1968/69 | Main and Mid crops totals taken from Gill and Duffus Cocoa Market Report No. 243 Jan. 1972. Regionals estimated by averaging 1965/66 and 1969/70. |
| 1969/70 | Main Crop C.M.B. Newsletter No. 50 April 1972. Mid Crop C.M.B. Newsletter No. 51 Aug. 1972. |
| 1970/71 | Main Crop C.M.B. Newsletter No. 51 Aug. 1972. Mid Crop total Gill and Duffus Cocoa Market Report No. 269, 25 June 1976. Regional totals estimated as in the same proportion as the main crop. |
| 1971/72 | Main and Mid Crops totals from Gill and Duffus Cocoa Market Report No. 269, 25 June 1976. Regional totals estimated from averages of 1969/70 and 1972/73. |
| 1972/73 | Main Crop C.M.B. Newsletter No. 55 Dec. 1973. Mid Crop C.M.B. Newsletter No. 56 April 1974. |
| 1973/74 | Main Crop C.M.B. Newsletter No. 58 Dec. 1974. Mid Crop C.M.B. Newsletter No. 59 April 1975. |
| 1974/75 | Mid and Main Crop totals from Gill and Duffus Cocoa Market Report No. 269, 25 June 1976. Regional totals estimated by averaging 1973/74 and 1975/76. |
| 1975/76 | Main Crop C.M.B. Newsletter No. 63 Aug. 1976. Mid Crop C.M.B. Newsletter No. 64 Dec. 1976. |
| 1976/77 | Main Crop C.M.B. Newsletter No. 66 Aug. 1977. Mid Crop Gill and Duffus Cocoa Market Report No. 293 Dec. 1980. Regional allocation assumed the same as for main crop. |

Appendix Table 2: Sources (Continued)

| | |
|---|---|
| 1977/78 | Totals from Gill and Duffus Cocoa Market Report No. 293 Dec. 1980. Regional totals allocated by averaging main crop of 1976/77 and 1978/79. |
| 1978/79 | Main Crop C.M.B. Newsletter No. 68/69 April/Aug. 1979. Mid Crop Gill and Duffus Cocoa Market Report No. 293 Dec. 1980. |

Appendix Table 3 Labour Productivity and Real Producer Income/ Man Year in Ghana's Cocoa Sector, 1925-1975

| | Bearing Acreage (000 acres) | Man days/ Year (000) | Output (000 tons) | Output/ Man day (lbs) | Output/ Man Year (lbs) | Real Producer Price (£1968/ton) | Real Income/ Man Year (£1968) |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1925 | 1200 | 30,000 | 218.2 | 16.3 | 407.5 | 206.3 | 38 |
| 1926 | 1265 | 31,625 | 230.8 | 16.3 | 407.5 | 188.3 | 34 |
| 1927 | 1330 | 33,250 | 209.9 | 14.1 | 353.5 | 241.6 | 38 |
| 1928 | 1395 | 34,875 | 225.1 | 14.5 | 361.5 | 314.9 | 51 |
| 1929 | 1460 | 36,500 | 238.1 | 14.6 | 365.3 | 236.5 | 39 |
| 1930 | 1525 | 38,125 | 190.6 | 11.2 | 280.0 | 227.0 | 28 |
| 1931 | 1590 | 39,750 | 244.1 | 13.8 | 343.9 | 126.0 | 19 |
| 1932 | 1655 | 41,375 | 233.8 | 12.7 | 316.4 | 145.3 | 21 |
| 1933 | 1720 | 43,000 | 255.7 | 13.3 | 333.0 | 127.9 | 19 |
| 1934 | 1785 | 44,625 | 220.0 | 11.0 | 276.1 | 89.7 | 11 |
| 1935 | 1890 | 47,250 | 277.2 | 13.1 | 328.5 | 127.3 | 16 |
| 1936 | 1995 | 49,875 | 285.0 | 12.8 | 320.0 | 140.9 | 20 |
| 1937 | 2100 | 52,500 | 300.0 | 12.8 | 320.0 | 252.5 | 36 |
| 1938 | 2205 | 55,125 | 232.0 | 9.4 | 235.7 | 123.4 | 13 |
| 1939 | 2310 | 57,750 | 298.0 | 11.6 | 289.0 | 96.3 | 12.4 |
| 1940 | 2415 | 60,375 | 241.7 | 9.0 | 224.2 | 99.4 | 9.9 |
| 1941 | 2520 | 63,000 | 237.0 | 8.4 | 210.7 | 64.2 | 6.0 |
| 1942 | 2625 | 65,625 | 250.7 | 8.6 | 213.9 | 69.6 | 6.6 |
| 1943 | 2730 | 68,250 | 207.3 | 6.8 | 170.1 | 58.0 | 4.4 |
| 1944 | 2835 | 70,875 | 196.1 | 6.2 | 154.9 | 58.0 | 4.0 |
| 1945 | 2940 | 73,500 | 228.7 | 7.0 | 174.2 | 89.2 | 6.9 |
| 1946 | 3045 | 76,125 | 209.4 | 6.2 | 154.0 | 101.5 | 7.0 |
| 1947 | 3150 | 78,750 | 192.1 | 5.5 | 136.6 | 183.9 | 11.2 |
| 1948 | 3220 | 80,500 | 207.6 | 5.8 | 144.4 | 236.4 | 15.2 |
| 1949 | 3290 | 82,250 | 278.4 | 7.6 | 189.5 | 333.2 | 28 |
| 1950 | 3360 | 84,000 | 247.8 | 6.6 | 165.2 | 201.9 | 15 |

Appendix Table 3 (Continued)

| | Bearing Acreage (000 acres) | Man days/ Year (000) | Output (000 tons) | Output/ Man day (lbs) | Output/ Man Year (lbs) | Real Producer Price (£1968/ton) | Real Income/ Man Year (£1968) |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1951 | 3310 | 82,750 | 262.2 | 7.1 | 177.4 | 270.6 | 21 |
| 1952 | 3260 | 81,500 | 210.7 | 5.8 | 144.8 | 302.8 | 20 |
| 1953 | 3210 | 80,250 | 247.0 | 6.9 | 172.4 | 275.3 | 21 |
| 1954 | 3160 | 79,000 | 207.7 | 5.9 | 147.2 | 286.6 | 19 |
| 1955 | 3110 | 77,750 | 219.8 | 6.3 | 158.3 | 273.8 | 19 |
| 1956 | 3060 | 76,500 | 228.8 | 6.7 | 167.5 | 290.0 | 22 |
| 1957 | 3200 | 80,000 | 255.7 | 7.2 | 179.0 | 288.6 | 23 |
| 1958 | 3340 | 83,500 | 206.5 | 5.5 | 138.5 | 259.6 | 16 |
| 1959 | 3480 | 87,000 | 255.5 | 6.6 | 164.5 | 248.4 | 18 |
| 1960 | 3620 | 90,500 | 317.1 | 7.8 | 196.2 | 209.0 | 18 |
| 1961 | 3760 | 94,000 | 432.2 | 10.3 | 257.5 | 195.8 | 23 |
| 1962 | 3900 | 97,500 | 408.6 | 9.4 | 234.7 | 162.1 | 17 |
| 1963 | 4040 | 101,000 | 421.3 | 9.3 | 233.6 | 154.8 | 16 |
| 1964 | 4180 | 104,500 | 421.0 | 9.0 | 225.6 | 127.8 | 13 |
| 1965 | 4320 | 108,000 | 571.7 | 11.9 | 296.4 | 99.1 | 13 |
| 1966 | 4410 | 110,250 | 409.2 | 8.3 | 207.8 | 76.3 | 7 |
| 1967 | 4500 | 112,500 | 375.3 | 7.5 | 186.8 | 88.8 | 7 |
| 1968 | 4590 | 114,750 | 415.0 | 8.1 | 202.5 | 99.3 | 9 |
| 1969 | 4680 | 117,000 | 333.6 | 6.4 | 159.7 | 98.3 | 7 |
| 1970 | 4770 | 119,250 | 411.0 | 7.7 | 193.0 | 109.0 | 9 |
| 1971 | 4770 | 119,250 | 421.0 | 7.9 | 197.7 | 102.2 | 9 |
| 1972 | 4770 | 119,250 | 457.3 | 8.6 | 214.7 | 70.2 | 7 |
| 1973 | 4770 | 119,250 | 415.2 | 7.8 | 195.0 | 84.6 | 7 |
| 1974 | 4770 | 119,250 | 365.9 | 6.9 | 171.8 | 89.0 | 7 |
| 1975 | 4770 | 119,250 | 369.5 | 6.9 | 173.5 | 85.0 | 7 |

Sources: Column (1) Table 3.9 (p. 83) and Table 3.12 (p.90).
Column (2) assumes 150 hours/acre/year = 25 man days/acre/year.
Column (3) Appendix Table 1.
Column (4) Column (3) x 2240/Column (2).
Column (5) Column (4) x 25.
Column (6) Appendix Table (4) Column (8).
Column (7) Column (5) x Column (6)/2240.

Appendix Table 4 World Cocoa Prices, Producer Cocoa Prices, Real and Nominal, 1900-1980

| | Unit Value of US imports cents/lb | Exchange Rate US$/£ | Unit Value of US imports £/ton | Ghana's cocoa exports £/ton | Cocoa Producer Price £/ton | Retail Price 1968=100 | Import Price 1968=100 | Real Producer Price £1968/ton | Real World Price £1968/ton |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| 1900 | 13.6 | 4.8717 | 62.5 | 54 | | 6.8 | 10.6 | | 509.4 |
| 1901 | 14.1 | 4.8786 | 64.7 | 43 | | 8.6 | 13.5 | | 318.5 |
| 1902 | 13.0 | 4.8764 | 59.7 | 39.6 | | 8.0 | 12.6 | | 314.3 |
| 1903 | 12.3 | 4.8682 | 56.6 | 37.4 | | 6.8 | 10.6 | | 352.8 |
| 1904 | 12.3 | 4.8717 | 56.6 | 38.5 | | 7.4 | 11.6 | | 331.9 |
| 1905 | 11.6 | 4.8663 | 53.4 | 36.7 | | 7.4 | 11.6 | | 316.4 |
| 1906 | 10.9 | 4.8573 | 50.3 | 36.9 | | 7.4 | 11.6 | | 318.1 |
| 1907 | 14.5 | 4.8667 | 66.7 | 54.2 | | 9.2 | 14.5 | | 373.8 |
| 1908 | 17.2 | 4.8684 | 79.1 | 42.0 | | 8.6 | 13.5 | | 311.1 |
| 1909 | 11.4 | 4.8760 | 52.3 | 36.9 | | 8.6 | 13.5 | | 273.3 |
| 1910 | 10.5 | 4.8676 | 48.3 | 37.7 | | 8.6 | 13.5 | | 279.3 |
| 1911 | 10.5 | 4.8660 | 48.3 | 40.0 | | 9.2 | 14.5 | | 275.9 |
| 1912 | 10.9 | 4.8701 | 50.1 | 41.9 | | 9.8 | 15.5 | | 270.3 |
| 1913 | 12.4 | 4.8689 | 57.0 | 48.5 | | 9.8 | 15.5 | | 312.9 |
| 1914 | 11.8 | 4.9296 | 53.6 | 41.5 | | 11.1 | 17.4 | | 238.5 |
| 1915 | 11.9 | 4.7570 | 56.0 | 47.3 | | 10.5 | 16.4 | | 288.4 |
| 1916 | 14.4 | 4.7660 | 67.7 | 53.3 | | 12.3 | 19.3 | | 276.2 |
| 1917 | 11.8 | 4.7644 | 55.5 | 34.6 | | 14.8 | 23.2 | | 149.1 |
| 1918 | 10.3 | 4.7651 | 48.4 | 27.1 | | 19.1 | 29.9 | | 90.6 |
| 1919 | 14.8 | 4.4258 | 74.9 | 47.0 | 31.5 | 22.1 | 34.8 | 142.5 | 135.1 |
| 1920 | 15.8 | 3.6643 | 96.6 | 80.6 | 75.5 | 26.4 | 41.5 | 286.0 | 194.2 |
| 1921 | 7.6 | 3.8490 | 44.2 | 35.8 | 20.5 | 22.8 | 35.7 | 89.9 | 100.3 |
| 1922 | 9.3 | 4.4292 | 47.0 | 36.7 | 23.0 | 15.4 | 24.1 | 149.4 | 152.3 |
| 1923 | 8.2 | 4.5748 | 40.2 | 32.8 | 25.5 | 16.0 | 25.1 | 159.4 | 130.7 |
| 1924 | 7.8 | 4.4171 | 39.6 | 32.5 | 23.0 | 16.6 | 26.1 | 138.6 | 124.5 |
| 1925 | 10.0 | 4.8289 | 46.4 | 37.7 | 33.0 | 16.0 | 25.1 | 206.3 | 150.2 |
| 1926 | 10.0 | 4.8582 | 46.1 | 39.8 | 29.0 | 15.4 | 24.1 | 188.3 | 165.1 |
| 1927 | 13.4 | 4.8610 | 61.7 | 55.9 | 43.0 | 17.8 | 28.0 | 241.6 | 199.6 |
| 1928 | 12.4 | 4.8662 | 57.1 | 49.9 | 48.5 | 15.4 | 24.1 | 314.9 | 207.1 |
| 1929 | 9.8 | 4.8569 | 45.2 | 40.8 | 35.0 | 14.8 | 23.2 | 236.5 | 175.9 |
| 1930 | 8.4 | 4.8621 | 38.7 | 36.6 | 32.0 | 14.1 | 22.2 | 227.0 | 164.9 |

Appendix Table 4 (Continued)

| | Unit Value of US imports cents/lb | Exchange Rate US$/£ | Unit Value of US imports £/ton | Ghana's cocoa exports £/ton | Cocoa Producer Price £/ton | Retail Price 1968=100 | Import Price 1968=100 | Real Producer Price £1968/ton | Real World Price £1968/ton |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| 1931 | 5.6 | 4.535 | 27.7 | 22.5 | 15.5 | 12.3 | 19.3 | 126.0 | 116.6 |
| 1932 | 4.1 | 3.5061 | 26.2 | 23.6 | 17.0 | 11.7 | 18.4 | 145.3 | 128.3 |
| 1933 | 4.0 | 4.2368 | 21.1 | 21.1 | 16.5 | 12.9 | 20.3 | 127.9 | 104.4 |
| 1934 | 4.4 | 5.0393 | 19.6 | 17.6 | 10.5 | 11.7 | 18.4 | 89.7 | 95.7 |
| 1935 | 4.4 | 4.9018 | 20.1 | 19.4 | 14.0 | 11.0 | 17.4 | 127.3 | 111.5 |
| 1936 | 5.2 | 4.9709 | 23.4 | 24.6 | 15.5 | 11.0 | 17.4 | 140.9 | 141.4 |
| 1937 | 8.5 | 4.944 | 38.5 | 42.3 | 35.6 | 14.1 | 22.2 | 252.5 | 190.5 |
| 1938 | 4.4 | 4.8894 | 20.2 | 17.3 | 17.4 | 14.1 | 22.2 | 123.4 | 77.9 |
| 1939 | 4.2 | 4.4354 | 21.2 | 18.2 | 13.0 | 13.5 | 21.2 | 96.3 | 85.8 |
| 1940 | 4.4 | 3.83 | 25.7 | 20.1 | 15.9 | (16.0) | 27.0 | 99.4 | 74.4 |
| 1941 | 5.6 | 4.0318 | 31.1 | 18.3 | 13.1 | 20.4 | 30.9 | 64.2 | 59.2 |
| 1942 | 7.7 | 4.035 | 42.7 | 19.3 | 14.9 | 21.4 | 37.7 | 69.6 | 51.2 |
| 1943 | 6.8 | 4.035 | 37.7 | 18.7 | 13.1 | 22.6 | 46.4 | 58.0 | 40.3 |
| 1944 | 6.8 | 4.035 | 37.7 | 19.2 | 13.1 | 22.6 | 49.3 | 58.0 | 38.9 |
| 1945 | 7.4 | 4.0302 | 41.1 | 30.8 | 22.4 | 25.1 | 51.2 | 89.2 | 60.2 |
| 1946 | 9.5 | 4.0328 | 52.8 | 40.2 | 27.1 | 26.7 | 48.3 | 101.5 | 83.2 |
| 1947 | 25.5 | 4.0286 | 141.8 | 92.3 | 51.3 | 27.9 | 64.7 | 183.9 | 142.7 |
| 1948 | 34.7 | 4.0313 | 192.8 | 196.8 | 74.7 | 31.6 | 73.4 | 236.4 | 268.1 |
| 1949 | 19.8 | 3.6872 | 120.3 | 129.1 | 121.3 | 36.4 | 74.4 | 333.2 | 173.5 |
| 1950 | 25.4 | 2.8007 | 203.1 | 204.2 | 84.0 | 41.6 | 77.3 | 201.9 | 264.2 |
| 1951 | 32.5 | 2.7996 | 260.0 | 262.8 | 130.7 | 48.3 | 95.6 | 270.6 | 274.9 |
| 1952 | 31.2 | 2.7926 | 250.3 | 247.8 | 149.3 | 49.3 | 98.5 | 302.8 | 251.6 |
| 1953 | 29.6 | 2.8127 | 235.7 | 237.3 | 130.5 | 47.4 | 96.6 | 275.3 | 245.7 |
| 1954 | 48.9 | 2.8087 | 390.0 | 395.1 | 134.4 | 46.9 | 85.0 | 286.6 | 464.8 |
| 1955 | 37.0 | 2.7913 | 296.9 | 318.4 | 135.0 | 49.3 | 83.0 | 273.8 | 383.6 |
| 1956 | 26.0 | 2.7957 | 208.3 | 217.8 | 148.5 | 51.2 | 86.0 | 290.0 | 253.3 |
| 1957 | 26.0 | 2.7932 | 208.5 | 195.5 | 149.2 | 51.7 | 87.0 | 288.6 | 224.7 |
| 1958 | 39.0 | 2.8098 | 310.9 | 315.9 | 134.2 | 51.7 | 86.0 | 259.6 | 367.3 |
| 1959 | 34.0 | 2.8088 | 271.1 | 274.9 | 131.9 | 53.1 | 86 | 248.4 | 319.7 |
| 1960 | 26.0 | 2.8076 | 207.4 | 219.4 | 112.0 | 53.6 | 91 | 209.0 | 241.1 |

Appendix Table 4 (Continued)

| | Unit Value of US imports cents/lb | Exchange Rate US$/£ | Unit Value of US imports £/ton | Ghana's cocoa exports £/ton | Cocoa Producer Price £/ton | Retail Price 1968= 100 | Import Price 1968= 100 | Real Producer Price £1968/ton | Real World Price £1968/ton |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| 1961 | 21 | 2.8022 | 167.9 | 171.0 | 112 | 57.2 | 91 | 195.8 | 187.9 |
| 1962 | 21 | 2.8078 | 167.5 | 159.2 | 100.8 | 62.2 | 96 | 162.1 | 165.8 |
| 1963 | 21 | 2.80 | 168.0 | 168.1 | 100.8 | 65.1 | 96 | 154.8 | 175.1 |
| 1964 | 21 | 2.7921 | 168.5 | 178.3 | 93.3 | 73.0 | 100 | 127.8 | 178.3 |
| 1965 | 15 | 2.7959 | 120.2 | 138.1 | 93.3 | 94.1 | 101 | 99.1 | 136.7 |
| 1966 | 17 | 2.793 | 136.3 | 131.5 | 74.7 | 97.9 | 104 | 76.3 | 126.4 |
| 1967 | 23 | 2.7504 | 187.3 | 171.4 | 80.8 | 91.0 | 101 | 88.8 | 169.7 |
| 1968 | 27 | 2.3935 | 252.7 | 230.5 | 99.3 | 100.0 | 100 | 99.3 | 230.5 |
| 1969 | 34 | 2.3901 | 318.6 | 295.6 | 107.1 | 108.9 | 103 | 98.3 | 287.0 |
| 1970 | 32 | 2.3959 | 299.2 | 340.1 | 122.2 | 112.1 | 107 | 109.0 | 317.9 |
| 1971 | 26 | 2.4442 | 238.3 | 269.7 | 118.9 | 116.3 | 114 | 102.2 | 236.6 |
| 1972 | 24 | 2.5008 | 215.0 | 217.1 | 91.1 | 129.7 | 124 | 70.2 | 175.1 |
| 1973 | 38 | 2.451 | 347.3 | 329.9 | 131.4 | 155.3 | 157 | 84.6 | 210.1 |
| 1974 | 64 | 2.3403 | 612.6 | 528.3 | 166.7 | 187.3 | 221 | 89.0 | 239.0 |
| 1975 | 62 | 2.2216 | 625.1 | 682.1 | 219.0 | 257.5 | 238 | 85.0 | 286.6 |
| 1976 | 68 | 1.8062 | 843.3 | 767.3 | 287.3 | 388.0 | 243 | 74.0 | 315.8 |
| 1977 | 126 | 1.7455 | 1617.0 | 1358.1 | 371.8 | 819.8 | 264 | 45.4 | 514.4 |
| 1978 | 146 | 1.9195 | 1703.8 | 1616.8 | 466.1 | 1406 | 288 | 33.2 | 561.4 |
| 1979 | 150 | 2.1216 | 1583.7 | | 464.0 | 2103 | 361 | 22.1 | |
| 1980 | 119 | 2.3263 | 1145.9 | | 635 | 2976 | | 21.3 | |
| 1981 | (94.19) | | | | | | | | |
| 1982 | (79.01) | | | | | | | | |
| 1983 | | | | | | | | | |
| 1984 | | | | | | | | | |

Appendix Table 4: Sources

| | | |
|---|---|---|
| Column (1) | 1900-1954 | FAO (1955) |
| | 1955-1980 | Gill and Duffus, Cocoa Statistics, Table 20, April 1981 |
| Column (2) | 1900-1975 | Friedman and Schwartz (1982) Table 4.9 |
| | 1975 onwards | IMF, International Financial Statistics Yearbook, 1981 |
| Column (3) | $= \dfrac{\text{Column (1)} \times 2240}{\text{Column (2)} \times 100}$ | |
| Column (4) | 1900-1960 | Kay (1972) |
| | 1960 onwards | Ghana, Economic Survey, various issues |
| Column (5) | 1900-1918 | Given in Annex to this Appendix |
| | 1919-1966 | Bateman (1974) except for 1937 when Beckett (1972) data used |
| | 1966-1976 | Nyanteng (1980) Table 5 gives data in Cedis/load of 60 lb. This is converted to £/ton by using exchange rates in Appendix Table 10 |
| | 1977-1981 | Ghana, Economic Survey, December 1981 gives data in Cedis/load of 30 kilograms |
| Column (6) | See sources for Appendix Table 5 | |
| Column (7) | 1900-1953 | Kay (1972: Table 20c) |
| | 1954-1970 | Stern (1972: Table 3) |
| | 1971-1979 | UNCTAD (1980); these were rebased to 1968=100. |
| Column (8) | $= \dfrac{\text{Column (5)} \times 100}{\text{Column (6)}}$ | |
| Column (9) | $= \dfrac{\text{Column (4)} \times 100}{\text{Column (7)}}$ | |

Appendix Table 4: Annex

| | Cocoa Producer Price | Cocoa Producer Price Adj. (0.75) | Retail Price 1968=100 | Real Producer Price £1968/ton |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| 1900 | 54.0 | 40.5 | 6.8 | 595.6 |
| 1901 | 43.7 | 32.8 | 8.6 | 381.4 |
| 1902 | 39.6 | 29.7 | 8.0 | 371.3 |
| 1903 | 37.8 | 28.4 | 6.8 | 417.6 |
| 1904 | 39.1 | 29.3 | 7.4 | 396.0 |
| 1905 | 36.7 | 27.5 | 7.4 | 371.6 |
| 1906 | 37.5 | 28.1 | 7.4 | 379.7 |
| 1907 | 55.1 | 41.3 | 9.2 | 448.9 |
| 1908 | 42.4 | 31.8 | 8.6 | 369.8 |
| 1909 | 40.5 | 30.4 | 8.6 | 353.5 |
| 1910 | 39.5 | 29.6 | 8.6 | 344.2 |
| 1911 | 41.5 | 31.1 | 9.2 | 338.0 |
| 1912 | 43.5 | 32.6 | 9.8 | 332.7 |
| 1913 | 44.5 | 33.4 | 9.8 | 340.8 |
| 1914 | 46.5 | 34.9 | 11.1 | 314.4 |
| 1915 | 33.5 | 25.1 | 10.5 | 239.0 |
| 1916 | 59.5 | 44.6 | 12.3 | 362.6 |
| 1917 | 37.5 | 28.1 | 14.8 | 189.9 |
| 1918 | 39.5 | 29.6 | 19.1 | 155.0 |

Note: The Cocoa Producer Price in Column (1) is from Bateman (1974). A comparison with the cocoa export price from the main table shows that over this period, 1900-1918, they are frequently above the export price. As this is clearly improbable we have reduced all the producer prices for this period by 25 per cent (the average marketing margin for the 1920s) giving the producer price shown in the table.

Appendix Table 5 Sources for Ghana's Retail Price Index, 1900-1980

| | FAO Import prices 1950/52=100 | Kay Import prices 1953=100 | Accra Retail price index 1954=100 | Accra Cost of Living (Berg) | Local Food | Local Food 1968=100 | Urban Consumer Price Index 1963=100 | Urban Consumer Price Index 1977=100 | Retail Price Index 1968=100 |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| 1900 | | 11 | | | | | | | 6.8 |
| 1901 | | 14 | | | | | | | 8.6 |
| 1902 | | 13 | | | | | | | 8.0 |
| 1903 | | 11 | | | | | | | 6.8 |
| 1904 | | 12 | | | | | | | 7.4 |
| 1905 | | 12 | | | | | | | 7.4 |
| 1906 | | 12 | | | | | | | 7.4 |
| 1907 | | 15 | | | | | | | 9.2 |
| 1908 | | 14 | | | | | | | 8.6 |
| 1909 | 15.1 | 14 | | | | | | | 8.6 |
| 1910 | 15.9 | 14 | | | | | | | 8.6 |
| 1911 | 16.3 | 15 | | | | | | | 9.2 |
| 1912 | 16.8 | 16 | | | | | | | 9.8 |
| 1913 | 16.7 | 16 | | | | | | | 9.8 |
| 1914 | 16.8 | 18 | | | | | | | 11.1 |
| 1915 | 18.8 | 17 | | | | | | | 10.5 |
| 1916 | 24.2 | 20 | | | | | | | 12.3 |
| 1917 | 30.0 | 24 | | | | | | | 14.8 |
| 1918 | 39.0 | 31 | | | | | | | 19.1 |
| 1919 | 50.6 | 36 | | | | | | | 22.1 |
| 1920 | 75.0 | 43 | | | | | | | 26.4 |
| 1921 | 64.1 | 37 | | | | | | | 22.8 |
| 1922 | 42.5 | 25 | | | | | | | 15.4 |
| 1923 | 41.7 | 26 | | | | | | | 16.0 |
| 1924 | 44.5 | 27 | | | | | | | 16.6 |
| 1925 | 43.9 | 26 | | | | | | | 16.0 |
| 1926 | 41.5 | 25 | | | | | | | 15.4 |
| 1927 | 39.0 | 29 | | | | | | | 17.8 |
| 1928 | 39.1 | 25 | | | | | | | 15.4 |
| 1929 | 35.4 | 24 | | | | | | | 14.8 |
| 1930 | 30.6 | 23 | | | | | | | 14.1 |

Appendix Table 5 (Continued)

| | FAO Import prices 1950/52=100 | Kay Import prices 1953=100 | Accra Retail price index 1954=100 | Accra Cost of Living (Berg) | Local Food | Local Food 1968=100 | Urban Consumer Price Index 1963=100 | Urban Consumer Price Index 1977=100 | Retail Price Index 1968=100 |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| 1931 | 23.4 | 20 | | | | | | | 12.3 |
| 1932 | 22.6 | 19 | | | | | | | 11.7 |
| 1933 | 20.8 | 21 | | | | | | | 12.9 |
| 1934 | 19.5 | 19 | | | | | | | 11.7 |
| 1935 | 21.0 | 18 | | | | | | | 11.0 |
| 1936 | 21.3 | 18 | | | | | | | 11.0 |
| 1937 | 24.8 | 23 | | | | | | | 14.1 |
| 1938 | 22.6 | 23 | | | | | | | 14.1 |
| 1939 | 21.4 | 22 | | 100 | 100 | 9 | | | 13.5 |
| 1940 | 27.7 | 28 | | – | – | – | | | (16.0) |
| 1941 | 31.5 | 32 | | 151 | 165 | 15 | | | 20.4 |
| 1942 | 38.5 | 39 | | 159 | 165 | 15 | | | 21.4 |
| 1943 | 44.0 | 48 | | 168 | 173 | 16 | | | 22.6 |
| 1944 | 45.5 | 51 | | 168 | 172 | 15 | | | 22.6 |
| 1945 | 51.0 | 53 | | 186 | 202 | 18 | | | 25.1 |
| 1946 | 59.0 | 50 | | 198 | 219 | 20 | | | 26.7 |
| 1947 | 80.9 | 67 | | 207 | 250 | 22 | | | 27.9 |
| 1948 | 86.7 | 76 | (66) | 91 | 264 | 24 | | | 31.6 |
| 1949 | 86.6 | 77 | (76) | 100 | 315 | 28 | | | 36.4 |
| 1950 | 86.5 | 80 | (87) | 115 | 391 | 35 | | | 41.6 |
| 1951 | 106.0 | 99 | (101) | 134 | 465 | 42 | | | 48.3 |
| 1952 | 107.5 | 102 | 103 | 131 | 460 | 41 | | | 49.3 |
| 1953 | 98.4 | 100 | 99 | 133 | 452 | 40 | | | 47.4 |
| 1954 | | 88 | 98 | 132 | 470 | 42 | | | 46.9 |
| 1955 | | 89 | 103 | 137 | 532*<br>79.1** | 48 | | | 49.3 |
| 1956 | | 79 | 107 | 139 | 84.9 | 51 | | | 51.2 |
| 1957 | | 80 | 108 | 143 | 84.8 | 51 | | | 51.7 |
| 1958 | | 81 | 108 | 140 | 84.0 | 51 | | | 51.7 |
| 1959 | | 80 | 111 | 150 | 87.3*<br>115.4** | 53 | | | 53.1 |
| 1960 | | 82 | 112 | 148 | 114.6 | 52 | | | 53.6 |

Appendix Table 5 (Continued)

| | FAO Import prices 1950/52=100 | Kay Import prices 1953=100 | Accra Retail price index 1954=100 | Accra Cost of living (Berg) | Local Food | Local Food 1968=100 | Urban Consumer Price Index 1963=100 | Urban Consumer Price Index 1977=100 | Retail Price Index 1968=100 |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| 1961 | | | 119.4 | | 121.6 | 55.3 | | | 57.2 |
| 1962 | | | 129.9 | | 133.8 | 60.8 | | | 62.2 |
| 1963 | | | 136.0 | | 129.0 | 58.6 | | | 65.1 |
| 1964 | | | 152.6 | | 162.5 | 74.0 | | | 73.0 |
| 1965 | | | 196.5 | | 226.4 | 102.9 | | | 94.1 |
| 1966 | | | 204.5 | | 235.2 | 106.9 | | | 97.9 |
| 1967 | | | 190.1 | | 193.5 | 88.0 | | | 91.0 |
| 1968 | | | 208.9 | | 220.0 | 100.0 | | | 100.0 |
| 1969 | | | 227.5 | | 252.6 | 114.8 | | | 108.9 |
| 1970 | | | 234.1 | | 260.8 | 118.5 | | | 112.1 |
| 1971 | | | 242.9 | | 267.8 | 121.7 | 194.4 | | 116.3 |
| 1972 | | | 274.9 | | 310.3 | 141.0 | 216.8 | | 129.7 |
| 1973 | | | 306.0 | | 359.3*<br>246.1** | 163.3 | 259.6 | | 155.3 |
| 1974 | | | | | 315.5 | 209.4 | 313.1 | | 187.3 |
| 1975 | | | | | 437.9 | 290.6 | 430.5 | | 257.5 |
| 1976 | | | | | 751.4 | 498.6 | 648.7 | | 388.0 |
| 1977 | | | | | 1599.6*<br>100.0** | 1061.4 | 1370.4 | 100.0 | 819.8 |
| 1978 | | | | | 163.5 | 1735.4 | | 171.5 | 1406 |
| 1979 | | | | | 283.7 | 3011.2 | | 256.5 | 2103 |
| 1980 | | | | | | | | 363.0 | 2976 |

Appendix Table 5: Sources

| | | |
|---|---|---|
| Column (1) | | FAO (1955) |
| Column (2) | | Kay (1972) |
| Column (3) | 1948–1961 | Ghana, Statistical Yearbook, 1961 |
| | 1962–1973 | Ghana, Economic Survey, various issues |
| Column (4) | 1939–1947 | Berg (1964: Table 10.3) |
| | 1948–1960 | Berg (1964: Table 10.9) |
| Column (5) | 1939–1955* | Birmingham (1960: 6) 1939=100 |
| | 1955**–1959* | Ghana, Statistical Yearbook, 1963 Local food component of the retail price index based on March 1963=100 |
| | 1959**–1973* | Ghana, Economic Survey, various issues Local food component of the retail price index based on 1954=100 |
| | 1973**–1977* | Bank of Ghana, Quarterly Economic Bulletin, various issues Local food component of the retail price index based on March 1963=100 |
| | 1977**–1979 | Food (i.e. both local and imported food) from Bank of Ghana, Quarterly Economic Bulletin, Vol. 19, No. 4, Oct-Dec 1982 component of the Consumer Price Index, Accra, 1977=100 |

Column (6) = Column (5) converted to 1968=100

| | |
|---|---|
| Columns (7) and (8) | Ghana, Economic Survey, 1977-1980 |
| Column (9) | Retail Price Index 1968=100 using columns (2), (4), (3), (7), (8) |

Appendix Table 6 Export Volume and Export Price for Cocoa and Non-Cocoa Exports, 1900-1978

Indices 1968=100

| | Export Volume | | | Export Price | | | Import Prices |
|---|---|---|---|---|---|---|---|
| | Non-Cocoa | Cocoa | Total | Non-Cocoa | Cocoa | Total | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1900 | 10.8 | 0.1 | 3.2 | 16.2 | 16.6 | 16.5 | 10.6 |
| 1901 | 7.8 | 0.3 | 2.4 | 14.6 | 13.3 | 13.6 | 13.5 |
| 1902 | 10.0 | 0.6 | 3.3 | 14.5 | 12.2 | 12.9 | 12.6 |
| 1903 | 11.0 | 0.6 | 3.6 | 15.0 | 11.5 | 12.5 | 10.6 |
| 1904 | 14.1 | 1.4 | 5.0 | 14.8 | 11.8 | 12.7 | 11.6 |
| 1905 | 15.1 | 1.3 | 5.3 | 15.8 | 11.3 | 12.6 | 11.6 |
| 1906 | 18.1 | 2.4 | 6.9 | 16.3 | 11.4 | 12.8 | 11.6 |
| 1907 | 22.6 | 2.5 | 8.2 | 16.7 | 16.7 | 16.7 | 14.5 |
| 1908 | 21.0 | 3.4 | 8.4 | 16.3 | 12.9 | 13.9 | 13.5 |
| 1909 | 19.4 | 5.4 | 9.4 | 16.5 | 11.4 | 12.8 | 13.5 |
| 1910 | 18.6 | 6.0 | 9.6 | 17.9 | 11.6 | 13.4 | 13.5 |
| 1911 | 21.0 | 10.6 | 13.6 | 16.8 | 12.3 | 13.6 | 14.5 |
| 1912 | 26.0 | 10.3 | 14.8 | 17.0 | 12.9 | 14.1 | 15.5 |
| 1913 | 27.7 | 13.5 | 17.5 | 16.9 | 14.9 | 15.5 | 15.5 |
| 1914 | 24.8 | 13.9 | 17.0 | 16.1 | 12.8 | 13.7 | 17.4 |
| 1915 | 24.2 | 20.3 | 21.4 | 15.5 | 14.6 | 14.9 | 16.4 |
| 1916 | 19.4 | 19.0 | 19.1 | 15.8 | 16.4 | 16.2 | 19.3 |
| 1917 | 27.4 | 23.9 | 24.9 | 16.0 | 10.7 | 12.2 | 23.2 |
| 1918 | 21.6 | 17.4 | 18.6 | 17.1 | 8.4 | 10.8 | 29.9 |
| 1919 | 21.1 | 46.3 | 39.1 | 17.4 | 14.5 | 15.3 | 34.8 |
| 1920 | 15.2 | 32.8 | 27.8 | 22.5 | 24.8 | 24.2 | 41.5 |
| 1921 | 12.8 | 35.0 | 28.7 | 22.8 | 11.0 | 14.4 | 35.7 |
| 1922 | 16.1 | 41.8 | 34.5 | 22.8 | 11.3 | 14.6 | 24.1 |
| 1923 | 17.2 | 52.7 | 42.6 | 24.7 | 10.1 | 14.3 | 25.1 |
| 1924 | 21.5 | 58.6 | 48.0 | 24.0 | 10.0 | 14.0 | 26.1 |
| 1925 | 24.1 | 57.3 | 47.8 | 24.0 | 11.6 | 15.1 | 25.1 |
| 1926 | 25.7 | 60.6 | 50.7 | 23.6 | 12.3 | 15.5 | 24.1 |
| 1927 | 25.3 | 55.2 | 46.6 | 22.5 | 17.2 | 18.7 | 28.0 |
| 1928 | 25.6 | 59.1 | 49.5 | 20.9 | 15.4 | 16.9 | 24.1 |
| 1929 | 30.3 | 62.5 | 53.3 | 19.1 | 12.6 | 14.4 | 23.2 |
| 1930 | 32.5 | 50.1 | 45.1 | 21.3 | 11.3 | 14.1 | 22.2 |

Appendix Table 6 (Continued)

| | Export Volume | | | Export Price | | | Import Prices |
|---|---|---|---|---|---|---|---|
| | Non-Cocoa | Cocoa | Total | Non-Cocoa | Cocoa | Total | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1931 | 27.9 | 64.1 | 53.8 | 17.7 | 6.9 | 10.0 | 19.3 |
| 1932 | 21.9 | 61.4 | 50.1 | 26.1 | 7.3 | 12.7 | 18.4 |
| 1933 | 28.4 | 62.0 | 52.4 | 24.4 | 6.5 | 11.6 | 20.3 |
| 1934 | 45.3 | 60.5 | 56.2 | 23.6 | 5.4 | 10.6 | 18.4 |
| 1935 | 41.2 | 70.6 | 62.2 | 25.1 | 6.0 | 11.4 | 17.4 |
| 1936 | 44.9 | 81.7 | 71.2 | 24.8 | 7.6 | 12.5 | 17.4 |
| 1937 | 56.0 | 62.0 | 60.3 | 25.8 | 13.0 | 16.7 | 22.2 |
| 1938 | 53.0 | 69.1 | 64.5 | 28.3 | 5.3 | 11.9 | 22.2 |
| 1939 | 57.3 | 73.7 | 69.0 | 29.2 | 5.6 | 12.3 | 21.2 |
| 1940 | 61.6 | 58.8 | 59.6 | 31.7 | 6.2 | 13.5 | 27.0 |
| 1941 | 61.9 | 57.5 | 58.8 | 31.8 | 5.6 | 13.1 | 30.9 |
| 1942 | 62.3 | 32.5 | 41.0 | 32.3 | 5.9 | 13.5 | 37.7 |
| 1943 | 55.8 | 49.2 | 51.1 | 32.5 | 5.7 | 13.4 | 46.4 |
| 1944 | 52.8 | 53.3 | 53.1 | 32.5 | 5.9 | 13.5 | 49.3 |
| 1945 | 53.4 | 61.0 | 58.8 | 33.8 | 9.5 | 16.4 | 51.2 |
| 1946 | 65.7 | 62.1 | 63.1 | 35.4 | 12.4 | 18.9 | 48.3 |
| 1947 | 57.5 | 47.3 | 50.2 | 39.4 | 28.4 | 31.6 | 64.7 |
| 1948 | 67.1 | 56.3 | 59.4 | 42.7 | 60.6 | 55.5 | 73.4 |
| 1949 | 68.9 | 69.2 | 69.1 | 50.5 | 39.8 | 42.8 | 74.4 |
| 1950 | 74.5 | 70.2 | 71.4 | 66.8 | 62.9 | 64.0 | 77.3 |
| 1951 | 80.7 | 60.3 | 66.1 | 84.1 | 81.0 | 81.9 | 95.6 |
| 1952 | 82.5 | 55.7 | 63.3 | 76.3 | 76.4 | 76.3 | 98.5 |
| 1953 | 88.6 | 62.1 | 69.7 | 71.3 | 73.1 | 72.6 | 96.6 |
| 1954 | 85.5 | 56.2 | 64.6 | 70.9 | 121.8 | 107.3 | 85.0 |
| 1955 | 92.5 | 54.1 | 65.0 | 70.8 | 98.1 | 90.3 | 83.0 |
| 1956 | 95.4 | 61.6 | 71.2 | 77.6 | 67.1 | 70.1 | 86.0 |
| 1957 | 112.4 | 68.3 | 80.9 | 78.5 | 60.3 | 65.5 | 87.0 |
| 1958 | 114.2 | 51.8 | 69.6 | 82.3 | 97.3 | 93.0 | 86.0 |
| 1959 | 125.1 | 65.7 | 82.6 | 77.9 | 84.7 | 82.8 | 86 |
| 1960 | 128.8 | 79.5 | 93.6 | 79.9 | 67.6 | 71.1 | 91 |

Appendix Table 6 (Continued)

| | Export Volume | | | Export Price | | | Import Prices |
|---|---|---|---|---|---|---|---|
| | Non-Cocoa | Cocoa | Total | Non-Cocoa | Cocoa | Total | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1961 | 112.8 | 107.4 | 108.9 | 82.8 | 65.0 | 70.1 | 91 |
| 1962 | 116.3 | 118.5 | 117.9 | 73.8 | 55.0 | 60.4 | 96 |
| 1963 | 101.6 | 112.9 | 109.7 | 73.8 | 58.8 | 63.1 | 96 |
| 1964 | 114.4 | 107.2 | 109.2 | 73.0 | 61.8 | 65.0 | 100 |
| 1965 | 107.3 | 143.5 | 133.2 | 73.1 | 48.1 | 55.2 | 101 |
| 1966 | 91.9 | 127.0 | 117.0 | 78.1 | 43.8 | 53.6 | 104 |
| 1967 | 90.6 | 101.8 | 98.6 | 86.4 | 71.3 | 75.6 | 101 |
| 1968 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100 |
| 1969 | 97.0 | 91.4 | 93.0 | 106.7 | 125.5 | 120.1 | 103 |
| 1970 | 99.2 | 106.2 | 104.2 | 98.3 | 145.3 | 131.9 | 107 |
| 1971 | 96.1 | 95.3 | 95.6 | 96.5 | 116.5 | 110.8 | 114 |
| 1972 | 117.4 | 120.9 | 119.9 | 141.0 | 126.7 | 130.8 | 124 |
| 1973 | 109.4 | 110.3 | 110.1 | 214.4 | 168.2 | 181.4 | 157 |
| 1974 | 87.2 | 94.0 | 92.1 | 292.8 | 265.4 | 273.2 | 221 |
| 1975 | 77.2 | 95.5 | 90.2 | 310.9 | 311.6 | 311.4 | 238 |
| 1976 | 72.3 | 96.8 | 89.8 | 325.3 | 286.5 | 297.5 | 243 |
| 1977 | 63.2 | 78.3 | 74.0 | 379.5 | 478.0 | 449.9 | 264 |
| 1978 | 62.5 | 63.4 | 63.2 | 481.4 | 822.6 | 725.3 | 288 |
| 1979 | | | | | | | 361 |

Appendix Table 6: Sources

| | | |
|---|---|---|
| Column (1) | 1900-1920 | Components are gold, rubber, palm oil, palm kernals, timber logs at 1911 prices |
| | 1920-1950 | Components are gold, diamonds, manganese, timber logs; 1968 prices |
| | 1950 onwards | Components are gold, diamonds, manganese, timber logs, timber sawn; 1968 prices |
| | | 1900-1920 was scaled up to 1968 prices |
| Column (2) | Cocoa includes | cocoa butter and cocoa paste after 1961 |
| | 1900-1920 | 1911 prices are used and as for non-cocoa scaled up to 1968 prices |
| | 1920 onwards | 1968 prices are used |

Column (3) is the appropriately weighted average of columns (1) and (2)

Columns (4) and (5) use the same commodities as constitute the volume indices of columns (1) and (2)

| | |
|---|---|
| 1900-1920 | 1911 quantities are used |
| 1920-1950 | 1937 quantities are used |
| 1950 onwards | 1968 quantities are used |

Indices for 1900-1950 are all scaled up to be equivalent to 1968 based indices

Column (6) is the appropriately weighted average of columns (4) and (5)

Columns (1) - (6) data taken from

| | |
|---|---|
| 1900-1960 | Kay (1972) |
| 1960 onwards | Ghana, Economic Survey, various issues |

Column (7) Appendix Table 4, column (7)

Appendix Table 7 Single and Double Factoral Terms of Trade for Cocoa, 1901-1975

Indices 1968=100

| | Barter Terms of Trade | Income Terms of Trade | Cocoa Productivity | Single Factoral Terms of Trade | UK industrial productivity | Double Factoral Terms of Trade |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| 1901 | 98.5 | 0.3 | 201 | 198 | 30 | 660 |
| 1925 | 46.2 | 26.5 | 201 | 93 | 43 | 216 |
| 1926 | 51.0 | 30.9 | 202 | 103 | 43 | 240 |
| 1927 | 61.4 | 33.9 | 175 | 108 | 46 | 235 |
| 1928 | 63.9 | 37.8 | 179 | 114 | 45 | 253 |
| 1929 | 54.3 | 33.9 | 180 | 98 | 47 | 209 |
| 1930 | 50.9 | 25.5 | 138 | 70 | 48 | 146 |
| 1931 | 35.8 | 22.9 | 170 | 61 | 47 | 130 |
| 1932 | 39.7 | 24.4 | 156 | 62 | 48 | 129 |
| 1933 | 32.0 | 19.9 | 164 | 52 | 48 | 108 |
| 1934 | 29.3 | 17.8 | 136 | 40 | 51 | 78 |
| 1935 | 34.5 | 24.3 | 162 | 56 | 53 | 106 |
| 1936 | 43.7 | 35.7 | 158 | 69 | 55 | 125 |
| 1937 | 58.6 | 36.3 | 158 | 93 | 56 | 166 |
| 1938 | 23.9 | 16.5 | 116 | 28 | 55 | 51 |
| 1939 | 26.4 | 19.5 | 143 | 38 | n.a. | n.a. |
| 1940 | 23.0 | 13.5 | 111 | 26 | n.a. | n.a. |
| 1941 | 18.1 | 10.4 | 104 | 18 | n.a. | n.a. |
| 1942 | 15.6 | 5.1 | 106 | 17 | n.a. | n.a. |
| 1943 | 12.2 | 6.0 | 84 | 10 | n.a. | n.a. |
| 1944 | 12.0 | 6.4 | 76 | 9 | n.a. | n.a. |
| 1945 | 18.6 | 11.3 | 86 | 16 | n.a. | n.a. |
| 1946 | 25.7 | 15.9 | 76 | 20 | 55 | 36 |
| 1947 | 43.9 | 20.8 | 67 | 29 | 54 | 54 |
| 1948 | 82.6 | 46.5 | 71 | 59 | 57 | 104 |
| 1949 | 53.5 | 37.0 | 94 | 50 | 60 | 83 |
| 1950 | 81.4 | 57.1 | 81 | 66 | 62 | 106 |

Appendix Table 7 (Continued)

| | Barter Terms of Trade | Income Terms of Trade | Cocoa Productivity | Single Factoral Terms of Trade | UK industrial productivity | Double Factoral Terms of Trade |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| 1951 | 84.7 | 51.1 | 88 | 75 | 62 | 121 |
| 1952 | 77.6 | 43.2 | 72 | 56 | 61 | 92 |
| 1953 | 75.7 | 47.0 | 85 | 64 | 65 | 98 |
| 1954 | 143.3 | 80.5 | 73 | 105 | 67 | 157 |
| 1955 | 118.2 | 63.9 | 78 | 92 | 69 | 133 |
| 1956 | 78.0 | 48.1 | 83 | 65 | 69 | 94 |
| 1957 | 69.3 | 47.3 | 88 | 61 | 70 | 87 |
| 1958 | 88.4 | 45.8 | 68 | 60 | 70 | 86 |
| 1959 | 98.5 | 64.7 | 81 | 80 | 75 | 107 |
| 1960 | 74.3 | 59.1 | 97 | 72 | 77 | 94 |
| 1961 | 71.4 | 76.7 | 127 | 91 | 77 | 118 |
| 1962 | 57.3 | 67.9 | 116 | 66 | 79 | 84 |
| 1963 | 61.3 | 69.2 | 115 | 70 | 82 | 85 |
| 1964 | 61.8 | 66.2 | 111 | 69 | 87 | 79 |
| 1965 | 47.6 | 68.3 | 146 | 69 | 89 | 78 |
| 1966 | 42.1 | 53.5 | 103 | 43 | 90 | 48 |
| 1967 | 70.6 | 71.9 | 92 | 65 | 93 | 70 |
| 1968 | 100.0 | 100.0 | 100.0 | 100.0 | 100 | 100.0 |
| 1969 | 121.8 | 111.4 | 79 | 96 | 102 | 94 |
| 1970 | 135.8 | 144.2 | 95 | 129 | 104 | 124 |
| 1971 | 102.2 | 97.4 | 98 | 100 | 107 | 93 |
| 1972 | 102.2 | 123.5 | 106 | 108 | 112 | 96 |
| 1973 | 107.1 | 118.2 | 96 | 103 | 119 | 87 |
| 1974 | 120.1 | 112.9 | 85 | 102 | 115 | 89 |
| 1975 | 130.9 | 125.0 | 86 | 113 | 113 | 100 |

Appendix Table 7: Sources

| | |
|---|---|
| Column (1) | Appendix Table 9, Column (2) |
| Column (2) | Appendix Table 9, Column (5) |
| Column (3) | Appendix Table 3, Column (4) converted into an index based on 1968=100 |
| Column (4) | Column (1) x Column (3)/100 |
| Column (5) | From 1901-1970 we take Industrial Output per Man-Year from The British Economy Key Statistics published for the London and Cambridge Economic Service by Times Newspapers<br>From 1970 we take output per person employed from the Index of Production Industries, Economic Trends, Central Statistical Office, Annual Supplement, 1983, page 97. |
| Column (6) | Column (4) x 100/Column (5) |

Appendix Table 8 Ghana's Imports and Exports, 1900-1978

| | Import Values (NC 000) | Import Price Index 1968=100 | Import Volume (NC1968 million) | Import Volume Index 1953=100 | Export Value (NC 000) | Cocoa Exports (NC 000) | Cocoa as % of total | UK Wholesale Prices 1968=100 |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 1900 | 2,566 | 10.6 | 24.2 | 7.1 | 1,770 | 54 | 3.1 | 16.3 |
| 1901 | 3,590 | 13.5 | 26.7 | 10.8 | 1,120 | 86 | 7.7 | 15.8 |
| 1902 | 4,240 | 12.6 | 33.7 | 11.5 | 1,548 | 190 | 12.3 | 15.8 |
| 1903 | 4,164 | 10.6 | 39.3 | 11.3 | 1,960 | 172 | 8.8 | 15.8 |
| 1904 | 4,002 | 11.6 | 34.5 | 10.0 | 2,680 | 400 | 15.0 | 16.0 |
| 1905 | 2,972 | 11.6 | 25.6 | 8.5 | 3,292 | 374 | 11.4 | 16.0 |
| 1906 | 4,116 | 11.6 | 35.5 | 9.7 | 3,992 | 672 | 16.8 | 16.5 |
| 1907 | 4,732 | 14.5 | 32.6 | 10.5 | 5,282 | 1,030 | 19.5 | 17.3 |
| 1908 | 4,058 | 13.5 | 30.1 | 10.5 | 5,050 | 1,082 | 21.4 | 16.7 |
| 1909 | 4,788 | 13.5 | 35.5 | 10.5 | 5,310 | 1,510 | 28.4 | 16.9 |
| 1910 | 6,878 | 13.5 | 50.9 | 13.1 | 5,394 | 1,732 | 32.1 | 17.7 |
| 1911 | 7,748 | 14.5 | 53.4 | 15.2 | 7,584 | 3,226 | 42.5 | 17.9 |
| 1912 | 8,046 | 15.5 | 51.9 | 16.7 | 8,614 | 3,286 | 38.1 | 18.8 |
| 1913 | 9,904 | 15.5 | 63.9 | 17.5 | 10,854 | 4,978 | 45.8 | 19.0 |
| 1914 | 8,912 | 17.4 | 51.2 | 14.7 | 9,884 | 4,388 | 44.4 | 19.2 |
| 1915 | 9,018 | 16.4 | 55.0 | 14.5 | 11,886 | 7,314 | 61.5 | 23.5 |
| 1916 | 11,998 | 19.3 | 62.2 | 19.3 | 11,632 | 7,696 | 66.2 | 30.4 |
| 1917 | 6,772 | 23.2 | 29.2 | 11.6 | 12,728 | 6,294 | 49.5 | 39.5 |
| 1918 | 6,512 | 29.9 | 21.8 | 7.7 | 8,944 | 3,594 | 40.2 | 43.8 |
| 1919 | 15,892 | 34.8 | 45.7 | 15.7 | 21,628 | 16,556 | 76.5 | 48.3 |
| 1920 | 30,304 | 41.5 | 73.0 | 25.3 | 24,704 | 20,112 | 81.4 | 60.0 |
| 1921 | 15,322 | 35.7 | 42.9 | 18.6 | 13,884 | 9,528 | 68.6 | 38.4 |
| 1922 | 15,800 | 24.1 | 65.6 | 21.4 | 16,670 | 11,682 | 70.1 | 31.0 |
| 1923 | 16,896 | 25.1 | 67.3 | 28.5 | 17,918 | 13,134 | 73.3 | 31.0 |
| 1924 | 16,630 | 26.1 | 63.7 | 25.9 | 19,828 | 14,500 | 73.1 | 32.6 |
| 1925 | 19,564 | 25.1 | 77.9 | 32.1 | 21,780 | 16,444 | 75.5 | 31.2 |
| 1926 | 20,570 | 24.1 | 85.4 | 31.9 | 24,208 | 18,362 | 75.9 | 28.8 |
| 1927 | 27,540 | 28.0 | 98.4 | 41.7 | 28,700 | 23,454 | 81.7 | 27.8 |
| 1928 | 24,400 | 24.1 | 101.2 | 43.8 | 27,684 | 22,458 | 81.2 | 27.5 |
| 1929 | 20,164 | 23.2 | 86.9 | 38.1 | 25,354 | 19,408 | 76.5 | 26.7 |
| 1930 | 17,906 | 22.2 | 80.7 | 36.3 | 22,574 | 13,940 | 61.8 | 23.5 |

Appendix Table 8 (Continued)

| | Import Values (NC 000) | Import Price Index 1968=100 | Import Volume (NC1968 million) | Import Volume Index 1953=100 | Export Value (NC 000) | Cocoa Exports (NC 000) | Cocoa as % of total | UK Wholesale Prices 1968=100 |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 1931 | 9,606 | 19.3 | 49.8 | 23.2 | 18,600 | 10,986 | 59.1 | 20.5 |
| 1932 | 11,210 | 18.4 | 60.9 | 29.1 | 16,696 | 11,022 | 66.0 | 20.0 |
| 1933 | 11,086 | 20.3 | 54.6 | 24.8 | 16,096 | 9,942 | 61.8 | 20.0 |
| 1934 | 9,696 | 18.4 | 52.7 | 25.8 | 16,234 | 8,082 | 49.8 | 20.8 |
| 1935 | 15,283 | 17.4 | 87.8 | 43.7 | 18,888 | 10,408 | 55.1 | 20.8 |
| 1936 | 17,563 | 17.4 | 100.9 | 50.0 | 24,934 | 15,320 | 61.4 | 22.1 |
| 1937 | 25,117 | 22.2 | 113.1 | 63.1 | 32,443 | 19,978 | 61.6 | 25.6 |
| 1938 | 15,733 | 22.2 | 70.9 | 39.2 | 22,857 | 9,082 | 39.7 | 23.7 |
| 1939 | 15,082 | 21.2 | 71.1 | 39.2 | 26,236 | 10,202 | 38.9 | 24.0 |
| 1940 | 14,237 | 27.0 | 52.7 | 31.9 | 27,737 | 8,990 | 32.4 | 32.0 |
| 1941 | 12,509 | 30.9 | 40.5 | 25.7 | 26,328 | 8,014 | 30.4 | 35.8 |
| 1942 | 17,686 | 37.7 | 46.9 | 29.8 | 24,469 | 4,770 | 19.5 | 37.4 |
| 1943 | 17,761 | 46.4 | 38.3 | 25.4 | 25,540 | 6,986 | 27.4 | 38.2 |
| 1944 | 17,970 | 49.3 | 36.5 | 23.4 | 24,788 | 7,780 | 31.4 | 39.0 |
| 1945 | 21,099 | 51.2 | 41.2 | 29.8 | 31,373 | 14,288 | 45.5 | 39.8 |
| 1946 | 26,440 | 48.3 | 54.7 | 33.7 | 40,607 | 18,976 | 46.7 | 41.1 |
| 1947 | 45,179 | 64.7 | 69.8 | 43.5 | 54,830 | 33,268 | 60.7 | 45.1 |
| 1948 | 62,756 | 73.4 | 85.5 | 51.8 | 112,229 | 84,332 | 75.1 | 51.5 |
| 1949 | 90,832 | 74.4 | 122.1 | 75.4 | 99,854 | 68,038 | 68.1 | 53.8 |
| 1950 | 96,258 | 77.3 | 124.5 | 76.0 | 154,814 | 109,208 | 70.5 | 61.5 |
| 1951 | 127,587 | 95.6 | 133.5 | 82.5 | 183,981 | 120,620 | 65.6 | 74.6 |
| 1952 | 133,221 | 98.5 | 135.2 | 85.8 | 172,704 | 105,066 | 60.8 | 76.9 |
| 1953 | 147,606 | 96.6 | 152.8 | 100.0 | 179,887 | 112,286 | 62.4 | 76.9 |
| 1954 | 142,100 | 85.0 | 167.2 | 108.1 | 229,190 | 169,198 | 73.8 | 77.7 |
| 1955 | 175,754 | 83.0 | 211.8 | 127.6 | 191,322 | 131,118 | 68.5 | 80.0 |
| 1956 | 177,840 | 86.0 | 206.8 | 130.0 | 173,198 | 102,124 | 59.0 | 83.1 |
| 1957 | 193,370 | 87.0 | 222.3 | 139.7 | 183,204 | 101,746 | 55.5 | 84.6 |
| 1958 | 169,186 | 86.0 | 196.7 | 124.4 | 209,116 | 124,636 | 59.6 | 82.3 |
| 1959 | 226,048 | 86.0 | 262.8 | 172.6 | 226,718 | 137,558 | 60.7 | 82.3 |
| 1960 | 259,400 | 91.0 | 285.1 | 192.3 | 231,978 | 132,868 | 57.3 | 83.1 |

Appendix Table 8 (Continued)

| | Import Values (NC 000) | Import Price Index 1968=100 | Import Volume (NC1968 million) | Import Volume Index 1953=100 | Export Values (NC 000) | Cocoa Exports (NC 000) | Cocoa as % of total | UK Wholesale Prices 1968=100 |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 1961 | 285,660 | 91 | 313.9 | n.a. | 230,270 | 141,458 | 61.4 | 84.6 |
| 1962 | 234,984 | 96 | 244.8 | n.a. | 229,994 | 141,535 | 61.5 | 85.4 |
| 1963 | 260,778 | 96 | 271.6 | n.a. | 217,976 | 143,481 | 65.8 | 86.2 |
| 1964 | 243,220 | 100 | 243.2 | n.a. | 229,280 | 145,106 | 63.3 | 89.2 |
| 1965 | 320,051 | 101 | 316.9 | n.a. | 226,883 | 148,802 | 65.6 | 91.5 |
| 1966 | 250,647 | 104 | 241.0 | n.a. | 191,394 | 115,770 | 60.5 | 94.6 |
| 1967 | 261,523 | 101 | 258.9 | n.a. | 246,800 | 155,627 | 63.1 | 94.6 |
| 1968 | 314,032 | 100 | 314.0 | n.a. | 342,040 | 214,142 | 62.6 | 100.0 |
| 1969 | 354,391 | 103 | 344.1 | n.a. | 397,658 | 245,953 | 61.9 | 103.8 |
| 1970 | 419,046 | 107 | 391.6 | n.a. | 467,379 | 331,551 | 70.9 | 109.2 |
| 1971 | 443,142 | 114 | 388.7 | n.a. | 373,896 | 236,972 | 63.4 | 116.9 |
| 1972 | 393,293 | 124 | 317.2 | n.a. | 564,412 | 327,990 | 58.1 | 122.7 |
| 1973 | 525,950 | 157 | 335.0 | n.a. | 730,440 | 397,048 | 54.4 | 144.6 |
| 1974 | 943,706 | 221 | 427.0 | n.a. | 840,933 | 535,400 | 63.7 | 194.2 |
| 1975 | 909,300 | 238 | 382.1 | n.a. | 1,005,100 | 637,000 | 63.4 | 230.4 |
| 1976 | 991,700 | 243 | 408.1 | n.a. | 953,400 | 593,100 | 62.2 | 281.4 |
| 1977 | 1,193,200 | 264 | 452.0 | n.a. | 1,221,100 | 797,300 | 65.3 | 329.6 |
| 1978 | 1,681,800 | 288 | 584 | n.a. | 1,580,600 | 1,110,100 | 70.2 | 343.2 |
| 1979 | | 361 | | n.a. | | | | 391.2 |
| 1980 | | | | | | | | |
| 1981 | | | | | | | | |

Appendix Table 8: Sources

| | | |
|---|---|---|
| Columns (1) and (5) | 1900-1934 | Kay (1972) |
| | 1935-1953 | Gold Coast External Trade, 1935-1953 |
| | 1954-1964 | Ghana, Statistical Yearbook, 1964 |
| | 1965-1968 | Ghana, Economic Survey, 1968 |
| | 1969-1974 | Ghana, Economic Survey, 1972-74 |
| | 1975-1978 | Ghana, Economic Survey, 1977-80 |
| Column (2) | Appendix Table 4, Column (7) | |

Column (3) $= \dfrac{\text{Column (1) x 100}}{\text{Column (2)}}$

Column (4) Kay (1972: Table 20b). This table gives a volume index of the constituents of imports. We have derived an aggregate index by weighting the components by their shares in 1926 from Kay (1972: Table 20a). The weights so derived were:

| | |
|---|---|
| Food, drinks & tobacco | 0.25 |
| Clothing, leather & textiles | 0.28 |
| Other consumer goods | 0.13 |
| Construction | 0.09 |
| Fuel | 0.06 |
| Other | 0.07 |
| Machinery | 0:05 |
| Transport equipment | 0.07 |

| | | |
|---|---|---|
| Column (6) | 1900-1960 | Kay (1972: Table 21a) |
| | 1960 onwards | Ghana, Economic Surveys |

Column (7) $= \dfrac{\text{Column (6) x 100}}{\text{Column (5)}}$

| | | |
|---|---|---|
| Column (8) | 1900-1970 | Mitchell (1975) |
| | 1970 onwards | Central Statistical Office, Economic Trends, Annual Supplement, 1983, p.114. Wholesale Price Index for materials and fuel purchased by manufacturing industry + all manufactured output (averaged). This appears consistent with the definition used by Mitchell. |

Appendix Table 8: Annex

Ady (1949) gives the following index of import prices (including duty) for the Gold Coast
(1938=100)

| 1921 | 1923 | 1926 | 1929 | 1932 | 1934 | 1937 | 1939 | 1942 | 1945 | 1947 |
|---|---|---|---|---|---|---|---|---|---|---|
| 240 | 159 | 159 | 139 | 98 | 92 | 105 | 97 | 149 | 192 | 276 |

Appendix Table 9 Ghana's Barter and Income Terms of Trade and Trade Balance, 1900-1978

Indices 1968=100

| | Barter Terms of Trade | | | Income Terms of Trade | | | Exports -Imports (NC 000s) |
|---|---|---|---|---|---|---|---|
| | Non-Cocoa | Cocoa | Total | Non-Cocoa | Cocoa | Total | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1900 | 152.8 | 156.6 | 155.7 | 16.5 | 0.2 | 5.0 | -796 |
| 1901 | 108.1 | 98.5 | 100.7 | 8.4 | 0.3 | 2.4 | -2470 |
| 1902 | 115.1 | 96.8 | 102.4 | 11.5 | 0.6 | 3.4 | -2692 |
| 1903 | 141.5 | 108.5 | 117.9 | 15.6 | 0.65 | 4.2 | -2204 |
| 1904 | 127.6 | 101.7 | 109.5 | 18.0 | 1.4 | 5.5 | -1322 |
| 1905 | 136.2 | 97.4 | 108.6 | 20.6 | 1.3 | 5.8 | 320 |
| 1906 | 140.5 | 98.3 | 110.3 | 25.4 | 2.4 | 7.6 | -124 |
| 1907 | 115.2 | 115.2 | 115.2 | 26.0 | 2.9 | 9.4 | 550 |
| 1908 | 120.7 | 95.6 | 103.0 | 25.4 | 3.2 | 8.6 | 992 |
| 1909 | 122.2 | 84.4 | 94.8 | 23.7 | 4.6 | 8.9 | 522 |
| 1910 | 132.6 | 85.9 | 99.3 | 24.7 | 5.2 | 9.5 | -1484 |
| 1911 | 115.9 | 84.8 | 93.8 | 24.3 | 9.0 | 12.8 | -164 |
| 1912 | 109.7 | 83.2 | 91.0 | 28.5 | 8.6 | 13.5 | 568 |
| 1913 | 109.0 | 96.1 | 100.0 | 30.2 | 13.0 | 17.5 | 950 |
| 1914 | 92.5 | 73.5 | 78.7 | 22.9 | 10.2 | 13.4 | 972 |
| 1915 | 94.5 | 89.0 | 90.9 | 22.9 | 18.1 | 19.4 | 2868 |
| 1916 | 81.9 | 85.0 | 83.9 | 15.9 | 16.1 | 16.0 | -366 |
| 1917 | 69.0 | 46.1 | 52.6 | 18.9 | 11.0 | 13.1 | 5956 |
| 1918 | 57.2 | 28.1 | 36.1 | 12.4 | 4.9 | 6.7 | 2432 |
| 1919 | 50.8 | 41.7 | 44.0 | 10.7 | 19.3 | 17.2 | 5736 |
| 1920 | 54.2 | 59.8 | 58.3 | 8.2 | 19.6 | 16.2 | -5600 |
| 1921 | 63.9 | 30.8 | 40.3 | 8.2 | 10.8 | 11.6 | -1438 |
| 1922 | 94.6 | 46.9 | 60.6 | 15.2 | 19.6 | 20.9 | 870 |
| 1923 | 98.4 | 40.2 | 57.0 | 16.9 | 21.2 | 24.3 | 1022 |
| 1924 | 92.0 | 38.3 | 53.6 | 19.8 | 22.4 | 25.7 | 3198 |
| 1925 | 95.6 | 46.2 | 60.2 | 23.0 | 26.5 | 28.8 | 2216 |
| 1926 | 97.9 | 51.0 | 64.3 | 25.2 | 30.9 | 32.6 | 3638 |
| 1927 | 80.4 | 61.4 | 66.8 | 20.3 | 33.9 | 31.1 | 1160 |
| 1928 | 86.7 | 63.9 | 70.1 | 22.2 | 37.8 | 34.7 | 3284 |
| 1929 | 82.3 | 54.3 | 62.1 | 24.9 | 33.9 | 33.1 | 5190 |
| 1930 | 95.9 | 50.9 | 63.5 | 31.2 | 25.5 | 28.6 | 4848 |

Appendix Table 9 (Continued)

| | Barter Terms of Trade | | | Income Terms of Trade | | | Exports -Imports (NC 000s) |
|---|---|---|---|---|---|---|---|
| | Non-Cocoa | Cocoa | Total | Non-Cocoa | Cocoa | Total | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1931 | 91.7 | 35.8 | 51.8 | 25.6 | 22.9 | 27.9 | 8994 |
| 1932 | 141.8 | 39.7 | 69.0 | 31.1 | 24.4 | 34.6 | 5486 |
| 1933 | 120.2 | 32.0 | 57.1 | 34.1 | 19.9 | 29.9 | 5010 |
| 1934 | 128.3 | 29.3 | 57.6 | 58.1 | 17.8 | 32.4 | 6538 |
| 1935 | 144.3 | 34.5 | 65.5 | 59.4 | 24.3 | 40.8 | 3605 |
| 1936 | 142.5 | 43.7 | 71.8 | 64.0 | 35.7 | 51.1 | 7371 |
| 1937 | 116.2 | 58.6 | 75.2 | 65.1 | 36.3 | 45.4 | 7326 |
| 1938 | 127.5 | 23.9 | 53.6 | 67.6 | 16.5 | 34.6 | 7124 |
| 1939 | 137.7 | 26.4 | 58.0 | 78.9 | 19.5 | 40.0 | 11,154 |
| 1940 | 117.4 | 23.0 | 50.0 | 72.3 | 13.5 | 29.8 | 13,500 |
| 1941 | 102.9 | 18.1 | 42.4 | 63.7 | 10.4 | 24.9 | 13,819 |
| 1942 | 85.7 | 15.6 | 35.8 | 53.4 | 5.1 | 14.7 | 6,783 |
| 1943 | 70.0 | 12.2 | 28.9 | 39.1 | 6.0 | 14.8 | 7,779 |
| 1944 | 65.9 | 12.0 | 27.4 | 34.8 | 6.4 | 14.5 | 6,818 |
| 1945 | 66.0 | 18.6 | 32.0 | 35.3 | 11.3 | 18.8 | 10,274 |
| 1946 | 73.3 | 25.7 | 39.1 | 48.1 | 15.9 | 24.7 | 14,167 |
| 1947 | 60.9 | 43.9 | 48.8 | 35.0 | 20.8 | 24.5 | 9,651 |
| 1948 | 58.2 | 82.6 | 75.6 | 39.0 | 46.5 | 44.9 | 49,473 |
| 1949 | 67.9 | 53.5 | 57.5 | 46.8 | 37.0 | 39.8 | 9,022 |
| 1950 | 86.4 | 81.4 | 82.8 | 64.3 | 57.1 | 59.1 | 58,556 |
| 1951 | 88.0 | 84.7 | 85.7 | 71.0 | 51.1 | 56.6 | 56,394 |
| 1952 | 77.5 | 77.6 | 77.5 | 63.9 | 43.2 | 49.0 | 39,533 |
| 1953 | 73.8 | 75.7 | 75.2 | 65.4 | 47.0 | 52.4 | 32,281 |
| 1954 | 83.4 | 143.3 | 126.2 | 71.3 | 80.5 | 81.5 | 87,090 |
| 1955 | 85.3 | 118.2 | 108.8 | 78.9 | 63.9 | 70.7 | 15,568 |
| 1956 | 90.2 | 78.0 | 81.5 | 86.1 | 48.1 | 58.0 | -4,642 |
| 1957 | 90.2 | 69.3 | 75.3 | 101.4 | 47.3 | 60.9 | -10,166 |
| 1958 | 95.7 | 88.4 | 108.1 | 109.3 | 45.8 | 75.3 | 39,930 |
| 1959 | 90.6 | 98.5 | 96.3 | 113.3 | 64.7 | 79.5 | 670 |
| 1960 | 87.8 | 74.3 | 78.1 | 113.1 | 59.1 | 73.1 | -27,422 |

Appendix Table 9 (Continued)

| | Barter Terms of Trade | | | Income Terms of Trade | | | Exports -Imports (NC 000s) |
|---|---|---|---|---|---|---|---|
| | Non-Cocoa | Cocoa | Total | Non-Cocoa | Cocoa | Total | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1961 | 91.0 | 71.4 | 77.0 | 102.6 | 76.7 | 83.9 | -55,390 |
| 1962 | 76.9 | 57.3 | 62.9 | 89.4 | 67.9 | 74.2 | -4,990 |
| 1963 | 76.9 | 61.3 | 65.7 | 78.1 | 69.2 | 72.1 | -42,802 |
| 1964 | 73.0 | 61.8 | 65.0 | 83.5 | 66.2 | 71.0 | -13,940 |
| 1965 | 72.4 | 47.6 | 54.7 | 77.7 | 68.3 | 72.8 | -93,168 |
| 1966 | 75.1 | 42.1 | 51.5 | 69.0 | 53.5 | 60.3 | -59,253 |
| 1967 | 85.5 | 70.6 | 74.9 | 77.5 | 71.9 | 73.8 | -14,723 |
| 1968 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 28,008 |
| 1969 | 103.6 | 121.8 | 116.6 | 100.5 | 111.4 | 108.4 | 43,267 |
| 1970 | 91.9 | 135.8 | 123.3 | 91.1 | 144.2 | 128.4 | 48,333 |
| 1971 | 84.6 | 102.2 | 97.2 | 81.3 | 97.4 | 92.9 | -69,246 |
| 1972 | 113.7 | 102.2 | 105.5 | 133.5 | 123.5 | 126.5 | 171,119 |
| 1973 | 136.6 | 107.1 | 115.5 | 149.4 | 118.2 | 127.2 | 204,490 |
| 1974 | 132.5 | 120.1 | 123.6 | 115.5 | 112.9 | 113.9 | -102,773 |
| 1975 | 130.6 | 130.9 | 130.8 | 100.8 | 125.0 | 118.0 | 95,800 |
| 1976 | 133.9 | 117.9 | 122.4 | 96.8 | 114.1 | 109.9 | -38,300 |
| 1977 | 143.8 | 181.1 | 170.4 | 90.9 | 141.8 | 126.1 | 27,900 |
| 1978 | 167.2 | 285.6 | 251.8 | 104.5 | 181.1 | 159.2 | -101,200 |

Appendix Table 9: Sources

Column (1) = Appendix Table 6 $\frac{\text{Column (4) x 100}}{\text{Column (7)}}$

Column (2) = Appendix Table 6 $\frac{\text{Column (5) x 100}}{\text{Column (7)}}$

Column (3) = Appendix Table 6 $\frac{\text{Column (6) x 100}}{\text{Column (7)}}$

Column (4) = Column (1) x $\frac{\text{Appendix Table 6 Column (1)}}{100}$

Column (5) = Column (2) x $\frac{\text{Appendix Table 6 Column (2)}}{100}$

Column (6) = Column (3) x $\frac{\text{Appendix Table 6 Column (3)}}{100}$

Column (7) = Appendix Table 8 Column (5) - Column (1)

Appendix Table 10 Exchange Rates, 1950-1980

| | US $/£ | $/Cedi | Cedi/£ |
|---|---|---|---|
| 1950 | 2.8007 | | |
| 1951 | 2.7996 | 1.4 | 2.0 |
| 1952 | 2.7926 | 1.4 | 2.0 |
| 1953 | 2.8127 | 1.4 | 2.0 |
| 1954 | 2.8087 | 1.4 | 2.0 |
| 1955 | 2.7913 | 1.4 | 2.0 |
| 1956 | 2.7957 | 1.4 | 2.0 |
| 1957 | 2.7932 | 1.4 | 2.0 |
| 1958 | 2.8098 | 1.4 | 2.0 |
| 1959 | 2.8088 | 1.4 | 2.0 |
| 1960 | 2.8076 | 1.4 | 2.0 |
| 1961 | 2.8022 | 1.4 | 2.0 |
| 1962 | 2.8078 | 1.4 | 2.0 |
| 1963 | 2.80 | 1.4 | 2.0 |
| 1964 | 2.7921 | 1.4 | 2.0 |
| 1965 | 2.7959 | 1.4 | 2.0 |
| 1966 | 2.793 | 1.4 | 2.0 |
| 1967 | 2.7504 | 1.19 | 2.31 |
| 1968 | 2.3935 | 0.98 | 2.44 |
| 1969 | 2.3901 | 0.98 | 2.44 |
| 1970 | 2.3959 | 0.98 | 2.44 |
| 1971 | 2.4442 | 0.9722 | 2.51 |
| 1972 | 2.5008 | 0.7620 | 3.28 |
| 1973 | 2.451 | 0.8622 | 2.84 |
| 1974 | 2.3403 | 0.8696 | 2.69 |
| 1975 | 2.2216 | 0.8696 | 2.55 |
| 1976 | 1.8062 | 0.8696 | 2.08 |
| 1977 | 1.7455 | 0.8696 | 2.01 |
| 1978 | 1.9195 | 0.6602 | 2.91 |
| 1979 | 2.1216 | 0.3636 | 5.83 |
| 1980 | 2.3263 | 0.3636 | 6.4 |
| 1981 | | | |
| 1982 | | | |
| 1983 | | | |

Source: IMF, International Financial Statistics Yearbooks.

Appendix Table 11 Wage Rates, 1900-1980

| | Minimum Wage Rate NC/day | Retail Price Index 1968=100 | Real Wage (NC1968/day) | Food Price Index 1968=100 | Cocoa Producer Price (£/ton) | Wage / Cocoa Price 1968=100 | Food / Cocoa 1968=100 |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1900 | 0.076 | 6.8 | 1.1 | | 40.5 | 24.8 | |
| 1901 | 0.076 | 8.6 | 0.9 | | 32.8 | 30.7 | |
| 1902 | 0.076 | 8.0 | 0.95 | | 29.7 | 33.9 | |
| 1903 | 0.076 | 6.8 | 1.1 | | 28.4 | 35.4 | |
| 1904 | 0.076 | 7.4 | 1.0 | | 29.3 | 34.3 | |
| 1905 | 0.076 | 7.4 | 1.0 | | 27.5 | 36.6 | |
| 1906 | 0.076 | 7.4 | 1.0 | | 28.1 | 35.8 | |
| 1907 | 0.076 | 9.2 | 0.8 | | 41.3 | 24.4 | |
| 1908 | 0.076 | 8.6 | 0.9 | | 31.8 | 31.6 | |
| 1909 | 0.076 | 8.6 | 0.9 | | 30.4 | 33.1 | |
| 1910 | 0.076 | 8.6 | 0.9 | | 29.6 | 34.0 | |
| 1911 | 0.076 | 9.2 | 0.83 | | 31.1 | 32.4 | |
| 1912 | 0.076 | 9.8 | 0.8 | | 32.6 | 30.9 | |
| 1913 | 0.076 | 9.8 | 0.8 | | 33.4 | 30.1 | |
| 1914 | 0.076 | 11.1 | 0.7 | | 34.9 | 28.8 | |
| 1915 | 0.076 | 10.5 | 0.72 | | 25.1 | 40.1 | |
| 1916 | - | 12.3 | | | 44.6 | | |
| 1917 | - | 14.8 | | | 28.1 | | |
| 1918 | - | 19.1 | | | 29.6 | | |
| 1919 | 0.2 | 22.1 | 0.9 | | 31.5 | 84.1 | |
| 1920 | 0.2 | 26.4 | 0.76 | | 75.5 | 35.1 | |
| 1921 | 0.2 | 22.8 | 0.9 | | 20.5 | 129.2 | |
| 1922 | 0.15 | 15.4 | 0.97 | | 23.0 | 86.3 | |
| 1923 | 0.15 | 16.0 | 0.94 | | 25.5 | 77.9 | |
| 1924 | 0.15 | 16.6 | 0.90 | | 23.0 | 86.3 | |
| 1925 | 0.15 | 16.0 | 1.0 | | 33.0 | 60.2 | |
| 1926 | 0.15 | 15.4 | 0.97 | | 29.0 | 68.5 | |
| 1927 | 0.15 | 17.8 | 0.84 | | 43.0 | 46.2 | |
| 1928 | 0.15 | 15.4 | 0.97 | | 48.5 | 40.9 | |
| 1929 | 0.15 | 14.8 | 1.0 | | 35.0 | 56.7 | |
| 1930 | 0.15 | 14.1 | 1.0 | | 32.0 | 62.1 | |

Appendix Table 11 (Continued)

| | Minimum Wage Rate NC/day | Retail Price Index 1968=100 | Real Wage (NC1968/day) | Food Price Index 1968=100 | Cocoa Producer Price (£/ton) | Wage / Cocoa Price 1968=100 | Food / Cocoa 1968=100 |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1931 | 0.13 | 12.3 | 1.0 | | 15.5 | 111.0 | |
| 1932 | 0.15 | 11.7 | 1.3 | | 17.0 | 116.8 | |
| 1933 | 0.15 | 12.9 | 1.2 | | 16.5 | 120.4 | |
| 1934 | 0.15 | 11.7 | 1.3 | | 10.5 | 189.1 | |
| 1935 | 0.15 | 11.0 | 1.4 | | 14.0 | 141.9 | |
| 1936 | 0.15 | 11.0 | 1.4 | | 15.5 | 128.1 | |
| 1937 | 0.15 | 14.1 | 1.1 | | 35.6 | 55.8 | |
| 1938 | 0.15 | 14.1 | 1.1 | | 17.4 | 114.1 | |
| 1939 | 0.14 | 13.5 | 1.0 | 9.0 | 13.0 | 142.6 | 69.2 |
| 1940 | 0.16 | 16.0 | 1.0 | | 15.9 | 133.2 | |
| 1941 | 0.18 | 20.4 | 0.9 | 14.8 | 13.1 | 181.9 | 113.0 |
| 1942 | 0.18 | 21.4 | 0.8 | 14.8 | 14.9 | 160.0 | 99.3 |
| 1943 | 0.18 | 22.6 | 0.8 | 15.5 | 13.1 | 181.9 | 118.3 |
| 1944 | 0.18 | 22.6 | 0.8 | 15.4 | 13.1 | 181.9 | 117.6 |
| 1945 | 0.18 | 25.1 | 0.7 | 18.1 | 22.4 | 106.4 | 80.8 |
| 1946 | 0.24 Av. | 26.7 | 0.9 | 19.6 | 27.1 | 117.3 | 72.3 |
| 1947 | 0.258 Av. | 27.9 | 0.9 | 22.4 | 51.3 | 66.6 | 43.7 |
| 1948 | 0.275 | 31.6 | 0.9 | 23.6 | 74.7 | 48.7 | 31.6 |
| 1949 | 0.29 | 36.4 | 0.8 | 28.2 | 121.3 | 31.7 | 23.2 |
| 1950 | 0.33 | 41.6 | 0.8 | 35.0 | 84.0 | 52.0 | 41.7 |
| 1951 | 0.33 | 48.3 | 0.7 | 41.6 | 130.7 | 33.4 | 31.8 |
| 1952 | 0.42 | 49.3 | 0.9 | 41.2 | 149.3 | 37.2 | 27.6 |
| 1953 | 0.45 | 47.4 | 0.95 | 40.4 | 130.5 | 45.7 | 31.0 |
| 1954 | 0.45 | 46.9 | 0.96 | 42.1 | 134.4 | 44.3 | 31.3 |
| 1955 | 0.45 | 49.3 | 0.91 | 47.6 | 135.0 | 44.1 | 35.3 |
| 1956 | 0.52 | 51.2 | 1.0 | 51.1 | 148.5 | 46.4 | 34.4 |
| 1957 | 0.52 | 51.7 | 1.0 | 51.0 | 149.2 | 46.1 | 34.2 |
| 1958 | 0.55 | 51.7 | 1.1 | 50.5 | 134.2 | 54.3 | 37.6 |
| 1959 | 0.55 | 53.1 | 1.0 | 52.5 | 131.9 | 55.2 | 39.8 |
| 1960 | 0.65 | 53.6 | 1.2 | 52.1 | 112.0 | 76.8 | 46.5 |

Appendix Table 11 (Continued)

| | Minimum Wage Rate NC/day | Retail Price Index 1968=100 | Real Wage (NC1968/day) | Food Price Index 1968=100 | Cocoa Producer Price (£/ton) | Wage / Cocoa Price 1968=100 | Food / Cocoa 1968=100 |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1961 | 0.65 | 57.2 | 1.1 | 55.3 | 112.0 | 76.8 | 49.4 |
| 1962 | 0.65 | 62.2 | 1.0 | 60.8 | 100.8 | 85.4 | 60.3 |
| 1963 | 0.65 | 65.1 | 1.0 | 58.6 | 100.8 | 85.4 | 58.1 |
| 1964 | 0.65 | 73.0 | 0.9 | 74.0 | 93.3 | 92.2 | 79.3 |
| 1965 | 0.65 | 94.1 | 0.7 | 102.9 | 93.3 | 92.2 | 110.3 |
| 1966 | 0.70 | 97.9 | 0.7 | 106.9 | 74.7 | 124.1 | 143.1 |
| 1967 | 0.70 | 91.0 | 0.8 | 88.0 | 80.8 | 114.7 | 108.9 |
| 1968 | 0.75 | 100.0 | 0.75 | 100.0 | 99.3 | 100.0 | 100.0 |
| 1969 | 0.75 | 108.9 | 0.7 | 114.8 | 107.1 | 92.7 | 107.2 |
| 1970 | 0.75 | 112.1 | 0.7 | 118.5 | 122.2 | 81.3 | 97.0 |
| 1971 | 0.75 | 116.3 | 0.6 | 121.7 | 118.9 | 83.5 | 102.4 |
| 1972 | 1.0 | 129.7 | 0.8 | 141.0 | 91.1 | 145.3 | 154.8 |
| 1973 | 1.0 | 155.3 | 0.6 | 163.3 | 131.4 | 100.8 | 124.3 |
| 1974 | 2.0 | 187.3 | 1.1 | 209.4 | 166.7 | 158.8 | 125.6 |
| 1975 | 2.0 | 257.5 | 0.8 | 290.6 | 219.0 | 120.9 | 132.7 |
| 1976 | 2.0 | 388.0 | 0.5 | 498.6 | 287.3 | 92.2 | 173.5 |
| 1977 | 3.0 | 819.8 | 0.4 | 1061.4 | 371.8 | 106.8 | 285.5 |
| 1978 | 4.0 | 1406 | 0.3 | 1735.4 | 466.1 | 113.6 | 372.3 |
| 1979 | 4.0 | 2103 | 0.2 | 3011.2 | 464.0 | 114.1 | 649.0 |
| 1980 | 5.33 | 2976 | 0.2 | | 635.0 | 111.1 | |

Appendix Table 11: Sources

Column (1) This wage rate series is compiled from

| | |
|---|---|
| 1900-1938 | Kay (1972: Table 12) |
| 1939-1954 | Berg (1964) |
| 1955-1969 | Rourke and Sakyi-Gyinae (1972) |
| 1970-1978 | Ashiabor (1979) |
| 1976-1980 | Ghana, Economic Survey 1977-80 |

All these sources have been converted to the common currency unit, new cedis/day

Column (2) Appendix Table 4, Column (6)

Column (3) $= \frac{\text{Column (1) x 100}}{\text{Column (2)}}$

Column (4) Appendix Table 5, Column (6)

Column (5) Appendix Table 4, Column (5) (and Annex)

Column (6) Column (1)/Column (5) converted to an index with base 1968=100

Column (7) $\frac{\text{Column (4) x 100}}{\text{Column (5)}}$

Appendix Table 12 Government Revenue and Expenditure, 1900-1980

| | Govt. Revenue | Govt. Expenditure NC (000s) | Govt. Revenue | Govt. Expenditure | Govt. Deficit(-) Surplus(+) | Minimum Wage Index 1968=100 | Real Govt. Expenditure NC1968m |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1900 | 764 | 1,806 | | | -1,042 | 10.1 | 17.9 |
| 1901 | 990 | 1,698 | | | -708 | 10.1 | 16.8 |
| 1902 | 1,020 | 2,358 | | | -1,338 | 10.1 | 23.3 |
| 1903 | 1,022 | 1,846 | | | -824 | 10.1 | 18.3 |
| 1904 | 1,066 | 1,076 | | | -10 | 10.1 | 10.7 |
| 1905 | 908 | 1,016 | | | -108 | 10.1 | 10.1 |
| 1906 | 1,022 | 1,088 | | | -66 | 10.1 | 10.8 |
| 1907 | 1,074 | 1,062 | | | 12 | 10.1 | 10.5 |
| 1908 | 1,198 | 1,312 | | | -114 | 10.1 | 13.0 |
| 1909 | 1,188 | 1,812 | | | -624 | 10.1 | 17.9 |
| 1910 | 1,510 | 1,882 | | | -372 | 10.1 | 18.6 |
| 1911 | 1,630 | 1,790 | | | -160 | 10.1 | 17.7 |
| 1912 | 1,798 | 1,950 | | | -152 | 10.1 | 19.3 |
| 1913 | 1,884 | 2,386 | | | -502 | 10.1 | 23.6 |
| 1914 | 1,968 | 2,928 | | | -960 | 10.1 | 29.0 |
| 1915 | 2,022 | 2,788 | | | -766 | 10.1 | 27.6 |
| 1916 | 2,756 | 2,434 | | | 322 | - | - |
| 1917 | 2,256 | 2,290 | | | -34 | - | - |
| 1918 | 1,690 | 2,172 | | | -482 | - | - |
| 1919 | 3,870 | 2,942 | | | 928 | - | - |
| 1920 | 5,970 | 6,378 | | | -408 | 26.7 | 23.9 |
| 1921 | 4,440 | 11,408 | | | -6,968 | 26.7 | 42.7 |
| 1922 | 4,924 | 6,986 | | | -2,062 | 20.0 | 34.9 |
| 1923 | 5,656 | 5,392 | | | 264 | 20.0 | 27.0 |
| 1924 | 5,792 | 9,694 | | | -3,902 | 20.0 | 48.5 |
| 1925 | 6,010 | 8,970 | | | -2,960 | 20.0 | 44.9 |
| 1926 | 6,400 | 9,284 | | | -2,884 | 20.0 | 46.4 |
| 1927 | 7,974 | 8,944 | | | -970 | 20.0 | 44.7 |
| 1928 | 7,542 | 8,572 | | | -1,030 | 20.0 | 42.9 |
| 1929 | 6,778 | 7,578 | | | -800 | 20.0 | 37.9 |
| 1930 | 5,326 | 6,964 | | | -1,638 | 20.0 | 34.8 |

Appendix Table 12 (Continued)

| | Govt. Revenue | Govt. Expenditure | Govt. Revenue | Govt. Expenditure | Govt. Deficit(-1) | Minimum Wage Index 1968=100 | Real Govt. Expenditure NC1968m |
|---|---|---|---|---|---|---|---|
| | | NC (000s) | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1931 | 4,556 | 5,244 | | | -688 | 17.3 | 30.3 |
| 1932 | 5,308 | 4,750 | | | 558 | 20.0 | 23.8 |
| 1933 | 5,308 | 4,336 | | | 972 | 20.0 | 21.7 |
| 1934 | 5,520 | 4,408 | | | 1,112 | 20.0 | 22.0 |
| 1935 | 6,462 | 4,802 | | | 1,660 | 20.0 | 24.0 |
| 1936 | 7,466 | 5,690 | | | 1,776 | 20.0 | 28.5 |
| 1937 | 7,496 | 6,388 | | | 1,108 | 20.0 | 31.9 |
| 1938 | 7,434 | 6,680 | | | 754 | 20.0 | 33.4 |
| 1939 | 7,408 | 7,162 | | | 246 | 18.7 | 38.3 |
| 1940 | 7,688 | 7,718 | | | -30 | 21.3 | 36.2 |
| 1941 | 8,236 | 7,094 | | | 1,142 | 24.0 | 29.6 |
| 1942 | 8,270 | 8,186 | | | 84 | 24.0 | 34.1 |
| 1943 | 8,572 | 9,008 | | | -436 | 24.0 | 37.5 |
| 1944 | 10,836 | 8,904 | | | 1,932 | 24.0 | 37.1 |
| 1945 | 14,290 | 11,914 | | | 2,376 | 24.0 | 49.6 |
| 1946 | 15,070 | 13,092 | | | 1,978 | 32.0 | 40.9 |
| 1947 | 20,418 | 19,804 | | | 614 | 34.4 | 57.6 |
| 1948 | 23,202 | 22,808 | | | 394 | 36.7 | 62.1 |
| 1949 | 36,116 | 28,118 | | | 7,998 | 38.7 | 72.7 |
| 1950 | 41,680 | 35,500 | | | 6,180 | 44.0 | 80.7 |
| 1951 | 77,858 | 46,152 | | | 31,706 | 44.0 | 104.9 |
| 1952 | 85,930 | 76,888 | | | 9,042 | 56.0 | 137.3 |
| 1953 | 96,856 | 96,104 | | | 752 | 60.0 | 160.2 |
| 1954 | 161,174 | 93,362 | | | 67,812 | 60.0 | 155.6 |
| 1955 | 102,558 | 112,502 | | | -9,944 | 60.0 | 187.5 |
| 1956 | 99,004 | 118,342 | | | -19,338 | 69.3 | 170.8 |
| 1957 | 119,844 | 115,462 | | | 4,382 | 69.3 | 166.6 |
| 1958 | 133,438 | 151,484 | | | -18,046 | 73.3 | 206.7 |
| 1959 | 140,462 | 174,236 | | | -33,774 | 73.3 | 237.7 |
| 1960 | 166,826 | 223,668 | | | -56,842 | 86.7 | 258.0 |

Appendix Table 12 (Continued)

| | | | Govt. Revenue | Govt. Expenditure | Govt. Deficit | Wage Index 1968=100 | Real Govt. Expenditure NC1968m |
|---|---|---|---|---|---|---|---|
| | | | NC (million) | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1961 | | | 161.0 | 227.8 | 66.8 | 86.7 | 262.7 |
| 1962 | | | 157.8 | 246.4 | 88.6 | 86.7 | 284.2 |
| 1963 | | | 182.4 | 274.6 | 92.2 | 86.7 | 316.7 |
| 1964 | | | 234.8 | 302.0 | 67.2 | 86.7 | 348.3 |
| 1965 | | | 284.0 | 371.1 | 87.1 | 86.7 | 428.0 |
| 1966 | | | 230.9 | 272.9 | 42.0 | 93.3 | 292.5 |
| 1967 | | | 253.8 | 320.2 | 66.4 | 93.3 | 343.2 |
| 1968 | | | 297.0 | 400.2 | 103.2 | 100.0 | 400.2 |
| 1969 | | | 332.0 | 395.3 | 63.3 | 100.0 | 395.3 |
| 1970 | | | 437.3 | 467.9 | 30.6 | 100.0 | 467.9 |
| 1971 | | | 450.7 | 523.8 | 73.1 | 100.0 | 523.8 |
| 1972 | | | 419.9 | 544.6 | 124.7 | 133.3 | 408.6 |
| 1973 | | | 485.0 | 651.3 | 166.3 | 133.3 | 488.6 |
| 1974 | | | 694.3 | 950.2 | 255.9 | 266.7 | 356.3 |
| 1975 | | | 893.8 | 1314.4 | 420.6 | 266.7 | 492.8 |
| 1976 | | | 1005.4 | 1809.6 | 804.2 | 266.7 | 678.5 |
| 1977 | | | 1266.5 | 2650.7 | 1384.2 | 400.0 | 662.7 |
| 1978 | | | 1996.5 | 3730.5 | 1734.0 | 533.3 | 699.5 |
| 1979 | | | 3221.0 | 5184.5 | 1963.5 | 533.3 | 972.2 |
| 1980 | | | 4119.9 | 6533.6 | 2413.7 | 710.7 | 919.3 |
| 1981 | | | | | | | |

Appendix Table 12: Sources

| | |
|---|---|
| Columns (1) and (2) | Kay (1972: Table 23)<br>The years are financial years. |
| Columns (3) and (4) | The years are calendar years |
| 1949/50 - 1950/51 | Ghana, Statistical Yearbook, 1961 |
| 1951/52 - 1953/54 | Ghana, Statistical Yearbook, 1963 |
| 1954/55 - 1963/64 | Ghana, Statistical Yearbook, 1964 |
| 1964 | IMF, International Financial Statistics, Supplement 1971 |
| 1965 onwards | IMF, International Financial Statistics, Yearbook 1981 |
| Column (5) from 1900-1960 | Columns (1) - (2) |
| from 1961 onwards | Columns (3) - (4) |

Column (6) Index based on 1968=100 from Appendix Table 11 Column (3)

| | |
|---|---|
| Column (7) from 1900-1960 | $\frac{\text{Column (2)} \times 100}{\text{Column (6)}}$ |
| from 1960 onwards | $\frac{\text{Column (4)} \times 100}{\text{Column (6)}}$ |

Appendix Table 13 Tax Rates on Cocoa 1916-1960

| | Cocoa Export Price £/ton | Cocoa Duty £000s | Cocoa Output 000 tons | Cocoa duty/ton £ | Producer Price £/ton | Tax Rate % | Producer World Price |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1916 | 53.3 | 32 | 72.1 | 0.44 | 44.6 | 1.0 | 75.0 |
| 1917 | 34.6 | 211 | 90.9 | 2.32 | 28.1 | 8.3 | 75.0 |
| 1918 | 27.1 | 131 | 66.3 | 1.98 | 29.6 | 6.7 | 75.0 |
| 1919 | 47.0 | 419 | 176.2 | 2.4 | 31.5 | 7.6 | 67.0 |
| 1920 | 80.6 | 580 | 124.8 | 4.6 | 75.5 | 6.1 | 93.7 |
| 1921 | 35.8 | 535 | 133.2 | 4.0 | 20.5 | 19.5 | 57.3 |
| 1922 | 36.7 | 535 | 159.4 | 3.4 | 23.0 | 14.8 | 62.7 |
| 1923 | 32.8 | 535 | 197.6 | 2.7 | 25.5 | 10.6 | 77.7 |
| 1924 | 32.5 | 535 | 223.2 | 2.4 | 23.0 | 10.4 | 70.8 |
| 1925 | 37.7 | 262 | 218.2 | 1.2 | 33.0 | 3.6 | 87.5 |
| 1926 | 39.8 | 262 | 230.8 | 1.1 | 29.0 | 3.8 | 72.9 |
| 1927 | 55.9 | 262 | 209.9 | 1.2 | 43.0 | 2.8 | 76.9 |
| 1928 | 49.9 | 262 | 225.1 | 1.2 | 48.5 | 2.5 | 97.2 |
| 1929 | 40.8 | 278 | 238.1 | 1.2 | 35.0 | 3.4 | 85.8 |
| 1930 | 36.6 | 222 | 190.6 | 1.2 | 32.0 | 3.8 | 87.4 |
| 1931 | 22.5 | 265 | 244.1 | 1.09 | 15.5 | 7.0 | 68.9 |
| 1932 | 23.6 | 265 | 233.8 | 1.13 | 17.0 | 6.6 | 72.0 |
| 1933 | 21.1 | 265 | 255.7 | 1.04 | 16.5 | 6.3 | 78.2 |
| 1934 | 17.6 | 269 | 220.0 | 1.22 | 10.5 | 11.6 | 60.0 |
| 1935 | 19.4 | 320 | 277.2 | 1.15 | 14.0 | 8.2 | 72.2 |
| 1936 | 24.6 | 320 | 285.0 | 1.12 | 15.5 | 7.2 | 63.0 |
| 1937 | 42.3 | 320 | 300.0 | 1.07 | 35.6 | 3.0 | 84.2 |
| 1938 | 17.3 | 320 | 232.0 | 1.38 | 17.4 | 7.9 | 100.0 |
| 1939 | 18.2 | 320 | 298.0 | 1.07 | 13.0 | 8.2 | 71.4 |
| 1940 | 20.1 | 412 | 241.7 | 1.70 | 15.9 | 10.7 | 79.1 |

Appendix Table 13 (Continued)

| | Cocoa Export Price £/ton | Cocoa Duty £000s | Cocoa Output 000 tons | Cocoa duty/ton £ | Producer Price £/ton | Tax Rate % | Producer World Price |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1941 | 18.3 | 412 | 237.0 | 1.74 | 13.1 | 13.3 | 71.6 |
| 1942 | 19.3 | 412 | 250.7 | 1.64 | 14.9 | 11.0 | 77.2 |
| 1943 | 18.7 | 412 | 207.3 | 1.99 | 13.1 | 15.2 | 70.1 |
| 1944 | 19.2 | 412 | 196.1 | 2.10 | 13.1 | 16.0 | 68.2 |
| 1945 | 30.8 | 702 | 228.7 | 3.07 | 22.4 | 13.7 | 72.7 |
| 1946 | 40.2 | 702 | 209.4 | 3.35 | 27.1 | 12.4 | 67.4 |
| 1947 | 92.3 | 702 | 192.1 | 3.65 | 51.3 | 7.1 | 55.6 |
| 1948 | 196.8 | 702 | 207.6 | 3.38 | 74.7 | 4.5 | 38.0 |
| 1949 | 129.1 | 702 | 278.4 | 2.52 | 121.3 | 2.1 | 94.0 |
| 1950 | 204.2 | 17,084 | 247.8 | 68.9 | 84.0 | 82.0 | 41.1 |
| 1951 | 262.8 | 17,084 | 262.2 | 65.2 | 130.7 | 49.9 | 49.7 |
| 1952 | 247.8 | 17,084 | 210.7 | 81.1 | 149.3 | 54.3 | 60.3 |
| 1953 | 237.3 | 17,084 | 247.0 | 69.2 | 130.5 | 53.0 | 55.0 |
| 1954 | 395.1 | 17,084 | 207.7 | 82.3 | 134.4 | 61.2 | 34.0 |
| 1955 | 318.4 | 28,785 | 219.8 | 131.0 | 135.0 | 44.74 | 42.4 |
| 1956 | 217.8 | 13,851 | 228.8 | 60.5 | 148.5 | 13.22 | 68.2 |
| 1957 | 195.5 | 12,511 | 255.7 | 48.9 | 149.2 | 33.79 | 76.3 |
| 1958 | 315.9 | 26,812 | 206.5 | 129.8 | 134.2 | 49.55 | 42.5 |
| 1959 | 274.9 | 23,976 | 255.5 | 93.8 | 131.9 | 37.07 | 48.0 |
| 1960 | 219.4 | 18,077 | 317.1 | 57.0 | 112.0 | 19.68 | 51.0 |

Sources:

Column (1) Appendix Table 4, Column (4)

Column (2) 1900-1960 Kay (1972: Table 24c)

Column (3) Appendix Table 1

Column (4) Column (2)/Column (3)

Column (5) Appendix Table 4, Column (5)

Column (6) 1916-1954 Column (5) x 100/Column (1)
1955-1960 Leith (1974: Table II-2, 13)

Column (7) Column (5) x 100/Column (1), except 1916-1918 when we assume 75.0 for reasons given in Appendix Table 4 Annex.

Appendix Table 14 World Cocoa Output; Ghana's Share of World Output and Relative Cocoa to Manufacturing Price

| | World Cocoa Output tonnes | Ghana's Cocoa Output tonnes | Ghana as % of world | World Cocoa Price £/ton | Unit Value of World Exports of Manuf. | = Index 1968=100 | Price of Cocoa relative to Manufactures £1968/ton |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1900 | 102 | 0.5 | 0.5 | 62.5 | 39 | 37 | 170 |
| 1901 | 115.3 | 1.0 | 0.9 | 64.7 | 37 | 35 | 185 |
| 1902 | 128.4 | 2.4 | 1.9 | 59.7 | 36 | 34 | 176 |
| 1903 | 126.9 | 2.3 | 1.8 | 56.6 | 36 | 34 | 166 |
| 1904 | 160.1 | 5.2 | 3.2 | 56.6 | 37 | 35 | 162 |
| 1905 | 150.3 | 5.2 | 3.5 | 53.4 | 37 | 35 | 153 |
| 1906 | 153.9 | 9.1 | 5.9 | 50.3 | 39 | 37 | 136 |
| 1907 | 152.8 | 9.5 | 6.2 | 66.7 | 41 | 39 | 171 |
| 1908 | 196.6 | 13.2 | 6.7 | 79.1 | 38 | 36 | 220 |
| 1909 | 214.0 | 20.4 | 9.5 | 52.3 | 38 | 36 | 145 |
| 1910 | 225.4 | 23.0 | 10.2 | 48.3 | 38 | 36 | 134 |
| 1911 | 251.2 | 40.4 | 16.0 | 48.3 | 38 | 36 | 134 |
| 1912 | 244.4 | 39.3 | 16.1 | 50.1 | 39 | 37 | 135 |
| 1913 | 263.5 | 51.4 | 19.5 | 57.0 | 39 | 37 | 154 |
| 1914 | 290.1 | 53.7 | 18.5 | 53.6 | | 42 | 128 |
| 1915 | 290.7 | 78.5 | 27.0 | 56.0 | | 42 | 133.3 |
| 1916 | 323.1 | 73.3 | 22.7 | 67.7 | | 49 | 138.2 |
| 1917 | 354.5 | 92.4 | 26.1 | 55.5 | | 51 | 108.8 |
| 1918 | 282.9 | 67.4 | 23.8 | 48.4 | | 53 | 91.3 |
| 1919 | 448.3 | 179.0 | 39.9 | 74.9 | | 56 | 133.8 |
| 1920 | 406.2 | 126.8 | 31.2 | 96.6 | | 58 | 166.6 |
| 1921 | 372.4 | 135.3 | 36.3 | 44.2 | 65 | 61 | 72.4 |
| 1922 | 431.6 | 161.9 | 37.5 | 47.0 | 58 | 55 | 86 |
| 1923 | 459.1 | 200.8 | 43.7 | 40.2 | 58 | 55 | 73 |
| 1924 | 489.2 | 226.8 | 46.4 | 39.6 | 58 | 55 | 72 |
| 1925 | 493.9 | 221.7 | 44.9 | 46.4 | 59 | 56 | 83 |
| 1926 | 476.3 | 234.5 | 49.2 | 46.1 | 56 | 53 | 87 |
| 1927 | 533.1 | 213.3 | 40.0 | 61.7 | 53 | 50 | 123 |
| 1928 | 510.8 | 228.7 | 44.8 | 57.1 | 53 | 50 | 114 |
| 1929 | 553.7 | 241.9 | 43.7 | 45.2 | 51 | 48 | 94 |
| 1930 | 545.5 | 193.6 | 35.4 | 38.7 | 50 | 47 | 82 |

Appendix Table 14 (Continued)

| | World Cocoa Output tonnes | Ghana's Cocoa Output | Ghana as % of world | World Cocoa Price | Unit Value of world Exports of Manuf. | = Index 1968=100 | Price of Cocoa relative to Manufactures £1968/ton |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1931 | 545.1 | 248.0 | 45.5 | 27.7 | 41 | 39 | 71 |
| 1932 | 565.8 | 237.5 | 42.0 | 26.2 | 34 | 32 | 82 |
| 1933 | 628.1 | 259.8 | 41.4 | 21.1 | 38 | 36 | 59 |
| 1934 | 608.6 | 223.5 | 36.7 | 19.6 | 45 | 42 | 47 |
| 1935 | 726.5 | 281.6 | 38.8 | 20.1 | 44 | 42 | 48 |
| 1936 | 729.7 | 289.6 | 39.7 | 23.4 | 44 | 42 | 56 |
| 1937 | 751.4 | 304.8 | 40.6 | 38.5 | 45 | 42 | 93 |
| 1938 | 736.0 | 235.7 | 32.0 | 20.2 | 47 | 44 | 46 |
| 1939 | 798.8 | 302.8 | 37.9 | 21.2 | | 47 | 45 |
| 1940 | 692.6 | 245.6 | 35.5 | 25.7 | | 51 | 50 |
| 1941 | 666.0 | 240.8 | 36.2 | 31.1 | | 54 | 58 |
| 1942 | 630.1 | 254.7 | 40.4 | 42.7 | | 58 | 74 |
| 1943 | 645.9 | 210.6 | 32.6 | 37.7 | | 62 | 61 |
| 1944 | 567.6 | 199.2 | 35.1 | 37.7 | | 67 | 56 |
| 1945 | 624.8 | 232.4 | 37.2 | 41.1 | | 71 | 58 |
| 1946 | 642.6 | 212.8 | 33.1 | 52.8 | | 76 | 69 |
| 1947 | 673.9 | 195.2 | 29.0 | 141.8 | | 82 | 173 |
| 1948 | 625.7 | 210.9 | 33.7 | 192.8 | 95 | 90 | 214 |
| 1949 | 762.0 | 282.9 | 37.1 | 120.3 | | 83 | 145 |
| 1950 | 776.9 | 251.8 | 32.4 | 203.1 | 81 | 76 | 267 |
| 1951 | 811.0 | 266.4 | 32.8 | 260.0 | 96 | 91 | 286 |
| 1952 | 646.0 | 214.1 | 33.1 | 250.3 | 98 | 92 | 272 |
| 1953 | 798.0 | 251.0 | 31.5 | 235.7 | 94 | 89 | 265 |
| 1954 | 771.0 | 211.0 | 27.4 | 390.0 | 92 | 87 | 448 |
| 1955 | 801.0 | 223.3 | 27.9 | 296.9 | 93 | 88 | 337 |
| 1956 | 837.0 | 232.5 | 27.8 | 208.3 | 97 | 92 | 226 |
| 1957 | 900.0 | 259.8 | 28.9 | 208.5 | 98 | 92 | 227 |
| 1958 | 781.0 | 209.8 | 26.9 | 310.9 | 97 | 92 | 338 |
| 1959 | 902.0 | 259.6 | 28.8 | 271.1 | 97 | 92 | 295 |
| 1960 | 1034.0 | 322.2 | 31.2 | 207.4 | 99 | 93 | 223 |

Appendix Table 14 (Continued)

| | World Cocoa Output tonnes | Ghana's Cocoa Output | Ghana as % of world | World Cocoa Price | Unit Value of world Exports of Manuf. | = Index 1968=100 | Price of Cocoa relative to Manufactures £1968/ton |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1961 | 1171 | 439.1 | 37.5 | 167.9 | 100 | 94 | 179 |
| 1962 | 1137 | 415.1 | 36.5 | 167.5 | 100 | 94 | 178 |
| 1963 | 1169 | 428.0 | 36.6 | 168.0 | 100 | 94 | 179 |
| 1964 | 1212 | 427.7 | 35.3 | 168.5 | 102 | 96 | 175 |
| 1965 | 1510 | 580.8 | 38.5 | 120.2 | 104 | 98 | 123 |
| 1966 | 1229 | 415.7 | 27.5 | 136.3 | 106 | 100 | 136 |
| 1967 | 1357 | 381.3 | 28.1 | 187.3 | 107 | 101 | 185 |
| 1968 | 1364 | 421.6 | 30.9 | 252.7 | 106 | 100 | 253 |
| 1969 | 1224 | 338.9 | 27.7 | 318.6 | | 101 | 315 |
| 1970 | 1433 | 417.6 | 29.1 | 299.2 | | 112 | 267 |
| 1971 | 1528 | 427.7 | 28.0 | 238.3 | | 121 | 197 |
| 1972 | 1589 | 464.6 | 29.2 | 215.0 | | 134 | 160 |
| 1973 | 1411 | 421.8 | 29.9 | 347.3 | | 158 | 220 |
| 1974 | 1448 | 371.8 | 25.7 | 612.6 | | 192 | 319 |
| 1975 | 1555 | 375.4 | 24.1 | 625.1 | | 224 | 279 |
| 1976 | 1499 | 400.4 | 26.7 | 843.3 | | 228 | 370 |
| 1977 | 1349 | 323.6 | 24.0 | 1617.0 | | 247 | 655 |
| 1978 | 1510 | 271.4 | 18.0 | 1703.8 | | 294 | 580 |
| 1979 | 1500 | 269.0 | 17.9 | 1583.7 | | 329 | 481 |
| 1980 | 1512 | 290.0 | 19.2 | 1145.9 | | | |
| 1981 | | 258.0 | | | | | |
| 1982 | | (225) | | | | | |
| 1983 | | (185) | | | | | |

Appendix Table 14: Sources

| | | |
|---|---|---|
| Column (1) | 1900-1955 | FAO (1955) |
| | 1955-1970 | Cocoa Statistics, FAO, various issues |
| | 1970 onwards | Quarterly Bulletin of Cocoa Statistics, ICCO, December 1979 |

Column (2) Appendix Table 1

Column (3) = Column (2) x 100/Column (1)

Column (4) Appendix Table 4, Column (3)

Column (5) 1900-1968 United Nations, Statistical Yearbook, 1969

From 1968 the series is an unweighted average of SITC 7 and 6 + 8 of Unit value index of exports to developing market economies from developed market economies.
Yearbook of International Trade Statistics Special Table D, 1980

Column (6) converts Column (5) to an index based on 1968=100

Column (7) = Column (4) x 100/Column (6)

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